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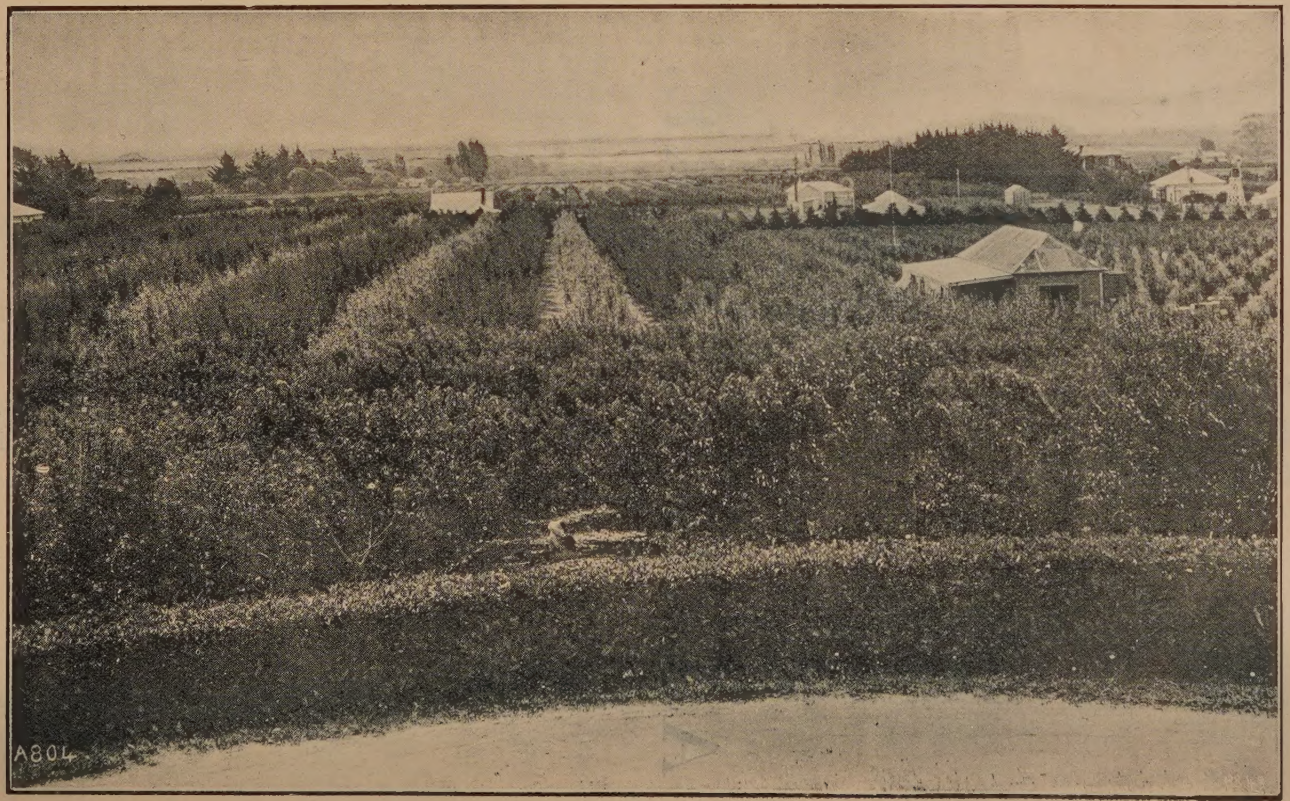


Orchard Land in he Motueka District Nelson.

The

Journal of Agriculture.

WELLINGTON, NEW ZEALAND,

20TH APRIL, 1915.

WHEAT-GROWING.

A. McTAGGART, B.S.A., M.S.A.

THERE is no plant that is more universally cultivated for the production of food for mankind than is wheat, and for this admirable purpose it has been grown for centuries. It grows in cool, temperate, and warm climates, and in many kinds of soil. Yet within this range of adaptability there are various conditions which so affect the crop, as regards quantity or yield and quality, as to determine, under normal economic conditions, its payability. Though climate and the nature of the soil are of first importance in the successful growing of milling-wheat, yet there are various factors connected with the seed itself, and with the treatment of the soil and the handling of the crop, which play a very important part in the economic production of this important cereal.

THE LAND AND ITS PREPARATION.

That wheat grows best on the stiffer soils and worst on sandy soils is a general principle observed with the culture of this great crop. But on most soils that are strong, or inclined to be strong, wheat can be successfully grown provided the climatic and seasonal conditions are favourable. A medium loam or a clay loam is considered the most favourable soil for growing wheat of good quality, provided that the climate is either cool or warm but comparatively dry, and that there is an abundance of sunshine during the period of growth. A good physical condition of the soil is also highly important in growing the crop successfully. Drainage and liming of the soil should be the first care of the wheat-grower, as it should be of the grower of any farm crop. Without a proper physical condition of the soil—brought about by thorough drainage, attention to the lime-content, and systematic cultivation—the land cannot make the full use of the fertilizers applied, and the nitrifying bacteria that are so essential to a fertile soil cannot perform their proper function of transforming organic nitrogen into soluble nitrates. Not only is lime necessary to provide a base for such nitrate-formation, but it is of great importance in that it neutralizes the acidity of the soil, thereby stimulating the activity of the nitrifying bacteria and, amongst other benefits, causing greater use to be made of an acid fertilizer like superphosphate, which is used so extensively in the growing of wheat. The addition of lime to the soil also increases the amount of phosphorus assimilated by the wheat-plant. The judicious application of lime, then, is decidedly in the interests of good wheat-growing; and it should be applied at a stage in the preparatory process to permit sufficient time to elapse to enable the material to exert its full action, or approximately so, ere the manures are applied and the wheat sown. For spring sowing, liming the previous autumn or early winter is suitable under normal conditions of soil and climate. On the average an application of lime every five years will keep the soil in good heart, and not be too exhaustive of organic matter (humus), which material is required in fair quantity for successful wheat-growing. Not only should the soil be well drained, and limed if in anyway acid, but it should be open, crumbly, and mellow, rendered thus by thorough and timely cultivation. As the wheat-plant requires a good supply of readily available nitrogen, preparing the land by growing a leguminous crop, such as clover or a mixture containing legumes, where the soil requires it, is an excellent practice. Fallowing land—that is, letting it lie bare in cultivated form for a definite period, to promote the accumulation of readily available nitrates, and to im-

prove the texture by weathering—is also considered good practice as a preparation for wheat, provided the rainfall is not heavy nor inclined to be heavy. Fallowing also provides a means of cleaning the land. Should the rainfall be always plentiful, as obtains in many districts in New Zealand, the practice of fallowing is conducive to a waste of fertility, and the soil being idle renders the economic loss greater on account of non-production. In districts of invariably little rainfall in winter but plenty of frost, the practice of fallowing by means of skim-ploughing and exposure to the atmosphere all winter, followed by cross-ploughing, disking, and harrowing well in early spring, is undoubtedly a good means of preparation, especially on the heavier soils. Where fallowing is inadvisable, however, preparatory crops should be made use of. Where nitrogen is inclined to be lacking, as on the lighter soils, the growing of a clover crop or a crop mixture containing clovers or other legumes should be practised. On the stronger soils the preparation of the land by growing rape or a turnip crop, and this well supplied with phosphates and cultivated, should be adopted. The cultivation mellows the soil and improves its texture generally, while the residue from the phosphate-manuring furnishes an important soil-constituent for use by the wheat-plant. The soil having been initially well prepared by the growing of preparatory crops, deep ploughing for the subsequent culture of wheat is not essential. This is because the crop requires a fairly firm seed-bed, especially in the underlying area of the surface soil, where there should obtain an unbroken flow of moisture upwards by capillarity to the roots of the wheat-plant.

In the manuring of wheat, as in the manuring of any other plant, there are various factors to be considered. The chief of these factors, however, are the requirements of the plant, the nature of the soil, and the climate or season. The dominant constituents of a manure for wheat, or the manurial ingredients most required by wheat, are phosphoric acid and nitrogen. The former is required in abundance, for the reason that it plays an important part in the soil in promoting root-development (for this reason it should be particularly supplied in abundance in fairly soluble form in a dry climate or in a dry season) and the formation of grain, especially the protein and germ of the wheat-grain. It also gives quality to the grain, hastens or promotes maturity, and offsets, as does potash, the effects of excessive nitrogen. Nitrogen, on the other hand, in readily available form is required to form protein and to promote abundant and vigorous growth of leaf and stem, without which, of course, there cannot be an abundance of grain. It generally prolongs the vegetative or growing period of the plant, and, as wheat naturally has a fairly long growing-period, a fair supply

of available nitrogen is necessary. Of potash the wheat-plant is not in special need, and it usually obtains from the soil what it requires for strengthening the straw, for the formation of starches and sugars, and for generally offsetting the effects of excessive nitrogen. The application of lime in some form to the soil also liberates potash and supplies the wheat-plant with all it needs of this constituent. There are soils, however, that would respond well to a potash manure in the mixture for wheat. These soils are of the lighter order, and ordinarily are not, or should not, be used much for growing wheat. As to the forms of phosphate and nitrogen, these depend upon the character and condition of the soil and to some extent upon the climate or season. Where the analysis or other indications, such as absence of dark colour, show that nitrogen is lacking, a nitrogenous manure is necessary. Where the climate is comparatively dry nitrate of soda gives good results. Where the soil is porous and the rainfall is abundant, however, sulphate of ammonia should be used, as it is not readily washed into the subsoil as is nitrate of soda. To get the full results from sulphate of ammonia (an acid fertilizer) there should be sufficient lime in the soil. In view of this fact, also, this fertilizer and superphosphate should give specially good results as fertilizers on soils that are not acid but, on the contrary, are inclined to be alkaline. Under average conditions of soil and climate, however, in the event of a nitrogenous manure being required for wheat, nitrate of soda gives best results, especially if used as a top-dressing to the growing crop. Our wheat lands as a rule contain sufficient nitrogen-supply, especially if legumes are grown previous to the wheat crop or a good rotation is practised. Phosphatic fertilizing, then, should be the wheat-grower's chief concern as regards manures; and it is of phosphorus that there is the greatest drain from soil, in that it is for the most part concentrated in the grain, the exportable part of the wheat-plant. As to the form and quantity of phosphate, this will depend upon the soil and its previous treatment and upon the moisture-supply. On clays and the heavier clay loams the best phosphate to use is basic slag, but this must be applied at least two months before seeding, on account of its relatively slow solubility. If these classes of soils have been previously well limed, however, good results can be obtained with superphosphate. On average loams whose lime-content has been periodically attended to, superphosphate is the standard phosphate for wheat. On the lighter loams, especially if they are deficient in lime, basic superphosphate gives good results, as it does on average loam soils inclined to be acid. Where time permits, however, it is preferable to first correct acidity with lime, and then use superphosphate, on

account of its superior diffusibility throughout the soil. On soils that are too dry to render basic slag soluble within a reasonable time, and that do not contain sufficient lime to render fully effective superphosphate, basic superphosphate is a suitable phosphate. Where basic slag is used on clay soils or clay loams, or where basic superphosphate is used on the lighter soils suitable for wheat, or where superphosphate is used on soils obviously lacking somewhat in nitrogen, a good accompanying phosphate is blood-and-bone manure, on account of the nitrogen it contains. It can be applied at the time of seeding, while the accompanying phosphate can be used either then or previously, according to its solubility. In the case of basic superphosphate this can be applied with the blood and bone at seeding, if the mixture is used the same day on which it is made. Though not quite as soluble as superphosphate, yet used with blood and bone it provides a more or less continuous supply of soluble phosphate to the growing crop. In a dry season or climate much better results are obtained from the more soluble phosphates. Where rape or a turnip crop has been grown previous to the wheat crop, a smaller quantity of phosphate will be required than ordinarily for the latter, on account of the residue from the previous phosphatic manuring. As to quantity of phosphate to use, in general, under average soil and cultural conditions, 3 cwt. superphosphate or 2 cwt. superphosphate and 1 cwt. blood and bone per acre, 2 cwt. to 3 cwt. basic superphosphate and 1 cwt. to 2 cwt. blood and bone, or 3 cwt. basic superphosphate per acre, according to conditions above described, is considered good manuring for wheat. Of basic slag 3 cwt. to 4 cwt. per acre is considered sufficient. Where ammonium sulphate is required, ¾ cwt. to 1 cwt. per acre, or where nitrate of soda is applied as a top-dressing, 1 cwt. to 2 cwt. per acre, is considered a good application.

In connection with the previous treatment of the land for wheat-growing, it is interesting to note the results of rotation experiments carried out over a period of twenty years at the North Dakota Experiment Station. The systems of cropping carried out in these experiments were continuous single cropping with wheat, and two-, three-, four-, five-, six-, and seven-year rotations consisting of wheat and one or more other crops. Taking the average of all the plots, those on which a rotation was practised yielded 5·99 bushels of wheat more than those on which wheat was seeded every year. The increase due to rotation the first five-year period was 1·51 bushels, for the second five-year period was 4 bushels, and for the third five-year period was 12·46 bushels. A simple change or alternative of crops was found not always beneficial. In the experiments the yield of wheat was increased when it was preceded by maize, potatoes,

mangels, rape, German millet, broom-corn or hog-millet, field-peas, medium red clover, and timothy. When preceded by oats, barley, spring rye, or flax the yield was practically the same as when wheat was grown continuously. While the beneficial effect of the various crops was very marked in the immediately succeeding crops in some years, the best results were not secured until the second year—*e.g.*, the first wheat crop after a cultivated crop sometimes had a high proportion of straw. In such instances the straw was usually soft and subject to attacks of rust, which caused material reduction in yield and quality of grain produced. In a dry season there was little increase in the yields of wheat on timothy or clover sod, but there was a marked increase in the second and third crops of wheat following. The yield of wheat was increased when a cultivated crop, a legume crop, or a grass crop was grown on the land in immediately preceding years; but the best yields were not obtained unless the rotation contained both a cultivated and a legume or grass crop. The largest total income per acre was derived when the cropping system was maize (farm-manured) one year, wheat three years; the second in rank was maize one year, wheat three years; and the third was millet (farm-manured) one year, wheat three years. The largest income derived from wheat produced was when the cropping system was millet (farm-manured) one year, wheat three years; the second in rank was maize (farm-manured) one year, wheat three years; and the third was fallow (farm-manured) one year, wheat three years. The fourth was maize one year and wheat three years. The beneficial effects of crop-rotation were most marked in a good-crop year or in a dry year. In a second series of experiments the highest average annual income was derived when the cropping system was potatoes one year, wheat three years; the second in rank was maize one year, wheat three years; and the third flax one year, wheat three years. The beneficial effects of manure were cumulative, as was evidenced in the marked rise in the increase in wheat-yield due to manuring as the years advanced. Green manures failed to produce an increase in the yield of wheat in the first two courses of a four-year rotation, but there was a marked increase in the third and fourth courses. Field-peas used as green manure produced a greater increase than millet. The increase in yield produced by farm manure and green manures, especially in the later years, indicated that where soils had been cropped with cereals continuously there had been a marked decrease in the supply of organic matter in the soil. Two or three pounds of medium red clover seeded with wheat produced an average increase of 1·81 bushels of wheat per acre. This latter points to the value of practising the growing of a legume with a cereal, not

only from the point of view of providing feed in the form of after-harvest growth, but also to stimulate and increase the yield of the grain. The soil upon which these experiments were conducted was described as black clay; and while the climatic and cultural conditions differ from conditions here, yet the behaviour of the wheat-plant according to the crop or crops preceding it at various dates is of interest and value to wheat-growers generally.

SEEDING.

After thorough cleaning, the grain before sowing should be pickled or treated with an effective solution which is a preventive against smut. There are two smuts that more commonly attack wheat. These are the loose smut of wheat (*Ustilago tritici*) and the stinking-smut or bunt of wheat (*Tilletia foetens*). For the former ordinary formalin and bluestone methods are not effective. The only effective method is what is known as Jensen's modified hot-water treatment, but, unfortunately, this is not practical on a large scale. For stinking-smut of wheat (and for loose smut of oats) the formalin (a 40-per-cent. solution of commercial formaldehyde) treatment is considered the best. It has been tested fully at the Ontario Agricultural College, and has given the best results of any of the various treatments tried. It is effective, handy, and cheap. The method consists of dissolving 1 lb. (1 pint) of formalin in 42 gallons of water, and immersing the sack of seed in the solution for twenty minutes. The operation is best performed by means of a good-sized barrel, and a rope connected with a pulley. The quantity of seed suspended in the solution can be regulated according to the size of the barrel. After immersion the grain should be rapidly dried to avoid injury to the germination-power. The smut balls, if any, should be skimmed off as they rise to the surface of the solution. Though this treatment is suitable for stinking-smut of wheat and loose smut of oats only, yet it should be used for all seed-wheat in preference to the bluestone treatment. Jensen's modified hot-water treatment, the only effective method of treating for loose smut of wheat, being applicable only to small quantities, cannot be recommended for use for large seedings, but for the production of a source of seed free from loose smut it is highly suitable.

Wheat, of course, grows better in drills, and about 9 in. is the distance apart usually sown. In parts of England wheat is inter-cultivated, this accounting largely for the high average yield there. As cultivation increases the yield of wheat, and as the price is higher than perhaps it ever was in this country, I doubt very much

whether it would not pay to meantime intercultivate this cereal where grown in comparatively small areas. During a dry season especially the growth would be markedly increased thereby, due to the moisture conserved, and the nitrate formation stimulated by fairly frequent cultivation. The significance of this from the national and Empire point of view is surely plain. The depth at which wheat is drilled ranges from 1 in. to 3 in. Within this range the drier the soil the deeper should it be sown, and the wetter the soil or the heavier the rainfall the shallower should be the seeding. Under average soil-conditions, however, the depth of sowing ranges from 1¼ in. to 1¾ in. The roughness of the seed-bed also influences the depth of seeding. On a rough-surface soil the sowing should be a little deeper than ordinarily, so as to ensure germination. The richer the soil and the more favourable the climatic conditions the shallower, within certain limits, should be the seeding. Under exceptionally favourable soil and climatic conditions as little as 1 bushel per acre has been sown, though the quantity could be increased without detriment to the productive power of the individual plants. In a comparatively dry climate as much as 3 bushels have been sown. This is to ensure the germination of a goodly percentage of the grains; but where they all germinate the subsequent struggle for moisture and food reduces the individual productive power of the wheat-plants. Hence it would seem more advisable to sow under fairly dry conditions a medium to large seeding, in preference to the large, of grain of strong vitality. Under average New Zealand conditions, however, the range is from 1½ to 2½ bushels per acre. In our best wheat-growing districts 1½ bushels was at one time the average, but now that the virgin fertility has been depleted to some extent 2 bushels per acre is more common and desirable. That the drill makes a difference in the yield from a seeding of wheat is not sufficiently realized. The older type of hoe drill is a good implement, and is well suited for districts of sufficient and plenteous rainfalls; but for districts where the moisture-supply is inclined to be lacking, as, for instance, in Otago Central, the more modern disk drills are specially suited, a fact that has been fully demonstrated in western North America. The double-disk drill especially is suited for comparatively dry soils in that the disks tend to pack the soil well round the grain as it falls between them, thereby enabling the seed to make the most of the diminished moisture-supply peculiar to the land.

After drilling, rolling is sometimes practised to provide an even surface, to consolidate a more or less open soil, and to promote greater capillarity or rise of moisture from below. Where this is done during a dry season or in a comparatively dry district it is a good practice to lightly harrow the surface after the roller, thereby

providing a light dust mulch, which tends to prevent the evaporation of moisture accelerated by the rolling process. After a shower of rain, and as soon as the ground is sufficiently dry to permit of its being traversed, it is also a good practice in such districts to lightly harrow for purposes of conserving the moisture that has fallen. In fact, it is sometimes found advantageous on the stiffer soils to harrow winter wheat in the spring, to break the crust that has formed as the result of the winter rains.

The crop should in any case, when about 4 in. high, be rolled, to increase foothold, to encourage stooling, to even the surface for subsequent even cutting, and to promote capillarity. As a rule it is good practice to feed off, with sheep, the wheat crop when it is a few inches high, more particularly if the soil is strong and the rainfall not lacking. Even under comparatively dry conditions, however, the practice is favoured, if judiciously handled, for it then tends to retard too-early maturity and increases the yield generally. The effects of feeding off in general are—promotion of stooling and increasing the root-system, hence foothold and feeding-power of the plant; decreasing the proportion of straw to grain, and thereby minimizing the risk of lodging; conserving moisture by providing ultimately greater protection to the surface soil, and increasing the total weight of grain by prolonging the vegetative period of the plant, and hence retarding maturity.

As to the suitability of varieties for certain localities, this is a matter for further investigation. There are certain varieties, however, which in general have been found suitable for certain locations and conditions. In Canterbury and North Otago the following wheats have given a good account of themselves from the point of view of yield: Red Marvel (French), Dreadnought (French), Hunter's White, Velvet Ear, Webb's Challenge, Talavera Tuscan, Red Chaff, Solid-straw Tuscan. Of these, Red Marvel and Dreadnought are particularly adapted for spring sowing, the former especially giving excellent results. For South Otago, Velvet Ear and Hunter's White are said to be most suitable, while for the wind-swept areas of Canterbury and Marlborough the Tuscan varieties are specially suitable. Where rust obtains to any extent the Solid-straw Tuscan gives satisfactory results.

In the wheat-growing sections of the North Island, where rust is more prevalent than it is in the South, Solid-straw Tuscan and Burgoyne's Fife have given good results. Though the climatic conditions in the North are specially favourable to rust-prevalence, yet a good deal can be done to prevent it by thorough drainage, liming, good cultivation, liberal use of suitable phosphates, sowing pure seed of good vitality and even germination, the avoidance of nitrogenous manures, promoting early maturity by early sowing, by judicious

phosphate manuring, and by other means of shortening the vegetative period of the crop, keeping hedges cut and fence-corners clear of weeds so as to provide a free circulation of air, and the cultivation of those races of cereals that are somewhat rust-resisting. Varieties of wheat with densely packed ears are usually resistant, though this is not always the case. Squarehead is a variety highly resistant to the disease, as is the Durum or macaroni type of wheat. The latter, however, are not suitable for good breadmaking. It has been said that autumn-sown wheats are less attacked by rust, owing to the fact that when the disease is most active in the spring the crop has already made its initial growth, and is consequently somewhat fitted to resist attack. This fact, together with that of earlier spring sowing, may be of service to districts where rust is prevalent.

HARVESTING.

The time to cut is not when the crop is dead ripe, as then it is more liable to shell with the wind, and by then the birds have a goodly share as a rule, and the quality of the grain is considered not so good. The crop should be cut when the straw is completely yellow with the exception of about 3 in. below the ear, this section being green. In the stook the ripening process continues, the whole length of straw ultimately yellowing, and the grain in the ear completing the maturation process without loss of quality and without loss of individual grains by wind. To thoroughly complete this process the grain should be left in stook for three weeks. When stacked, also, the wheat should not be threshed before it has remained in the stack for three weeks. Therein it "sweats," the quality for milling and baking purposes being improved thereby. Wheat threshed from the stook will not be of such good quality, unless under special dry atmospheric conditions, as that from the stack, owing to the absence of this "sweating." In this latter process carbon dioxide and a portion of the moisture is lost from the grain, there being in consequence thereof a slight reduction in the percentage of starch, and the percentage of protein is thereby slightly increased. In like manner both grain and flour improve with storage, their "strength" or breadmaking quality being, within certain limits, enhanced. Thus larger loaves can be baked from a definite weight of stored flour than can from an equal weight of the original flour, and this is all the more marked where the flour has been ground from a wheat of comparatively recent production.

QUALITY IN WHEAT, AND DISTRICTS MORE LIKELY TO PRODUCE THIS.

When in Canada the writer made, for purposes of a graduating thesis, a special study of Red Fife wheat (grown at various points

across the Dominion), from the point of view of environment influencing "strength," or breadmaking quality. Exhaustive analyses and baking tests were carried out, and the results thereof, as far as possible, were correlated with data regarding environment—total precipitation (rainfall) during the period of growth, total hours of sunshine, range of temperature, the nature of the season, the nature of the soil, and the previous treatment of the soil. Besides correlating "strength" in wheat with certain conditions appertaining to location, season, and soil, and associating to some extent certain phases of the chemistry of the wheat-kernel with quality, general conclusions were arrived at. Certain of these were but the verification of the findings of others. The following are among the conclusions:—

(1.) High baking-value is produced by sufficient and not excessive rainfall, high temperature (especially during the period from formation of the kernel to the ripened stage), and abundant sunshine. A good season is of paramount importance in producing wheat possessing "strength."

(2.) Cool but dry conditions during the later stages of the growth of the kernel may produce an excellent flour for breadmaking purposes.

(3.) While abundant sunshine is not absolutely essential for the production of a high portein-content, yet it would appear that on the whole it is of first importance in producing flours of high baking-value.

(4.) While soil exerts some influence on the quality of the wheat, yet the season is the more important factor. It would appear that the best wheat was produced on soils of a medium character.

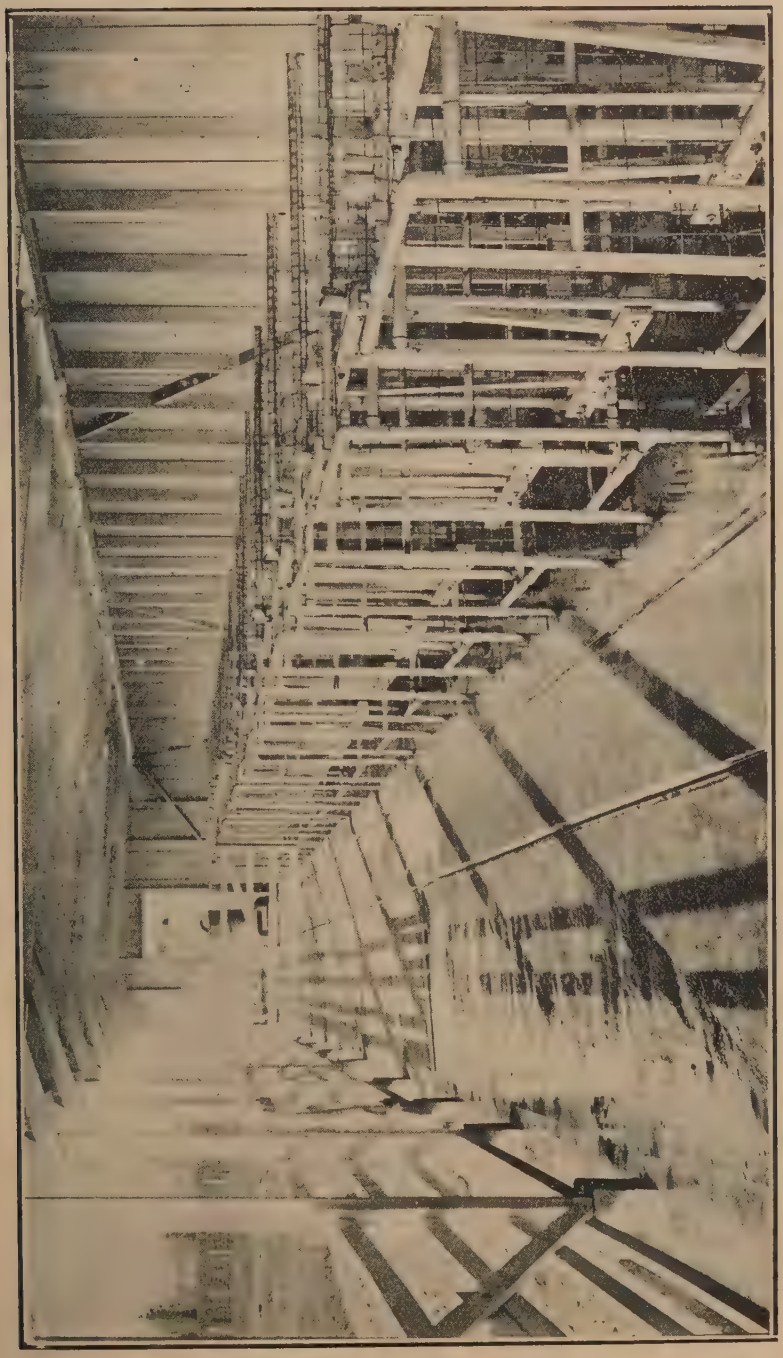
(5.) Abundant sunshine and a comparatively dry atmosphere are the most consistent climatic factors in the production of "strength," or, to be exact, in the improvement of "strength" where it already exists.

Applying these findings to New Zealand conditions, we would naturally expect that our coastal lands while suitable for the culture of this cereal, yet are not particularly suited for the production of high-quality wheat. Wheat on the whole grown on these lands would be large, plump, and starchy, comparatively soft, and relatively low in protein-content, due to the abundant rainfall and natural humid atmospheric conditions. The flour with low percentage of protein, which material is more directly responsible for causing the dough to rise, yields a smaller loaf than wheat possessing a high percentage. For this reason the millers usually mix wheat obtained from the interior, or from Australia, with wheat

grown in our coastal districts. As one proceeds back from the coast the conditions in general become more suited for the growing of wheat possessing quality. To be more specific in this contention, I have to some extent localized certain districts in the South Island as regards their adaptability for the production of high-quality wheat. The rainfalls peculiar to the districts in Canada which produced the wheats yielding the largest loaves have been compared with those of localities distributed throughout the South Island. The latter figures were obtained through the courtesy of the Rev. D. C. Bates, Director of the Meteorological Department, and represent the mean or average for a period of years. On comparing the mean or average rainfalls for the growing-period of the favoured localities in Canada with those in southern New Zealand, I have listed a number of districts that should, from the climatic standpoint, grow wheat of high quality, as distinguished from yield. These districts are as follows: Grovetown (Blenheim), Seddon, Waikare, Southbridge, Lincoln, Orari, Fairlie, Waimate (well back from the coast area), Kurow, Bushey Park (Palmerston South), Tarras, Clyde, Ranfurly, Roxburgh, Balclutha.

These points represent the centres of fairly extensive districts, for which the contention as to suitability for growing high-quality wheat would apply. Doubtless there are a few other districts, for which I was unable to obtain meteorological data, that will grow wheat of high breadmaking value. Hawea Flat, for instance, is noted for its excellent milling-wheat, and should possess meteorological conditions that would support the above-mentioned findings. Clyde and Ranfurly districts are more suited climatically for growing autumn-sown wheat than for spring-sown. The autumn and winter precipitation establishes the plant before spring, and so enables it to withstand the subsequent dry conditions and generally to make more of the available moisture and food-supply, because of its increased root-system. This principle of seeding, in fact, applies to grass and certain other crops in these and other districts of equally low rainfall.

From the above references to the effect of environment upon wheat it will be seen that much can be made of this phase of the subject alone. The growing of wheat in localities naturally fitted climatically for the production of quality, the culture of varieties best suited for particular districts, systematic improvement of wheat, better cultural methods, more particularly as regards rotation of crops and the proper physical and chemical treatment of the soil, and where possible improved methods of handling the crop, should, irrespective of greater difficulties, go far toward rendering the growing of this important cereal economically possible.



THE CALF-PENS AT THE WERAROA EXPERIMENTAL FARM.

SHELTER.

AORANGI.

We are so accustomed to see cattle grazing in shelterless paddocks, and to read of them being presumably so grazed for generations past, that it is only the old pioneers and a few of our present wayback farmers, who have had to fight the natural tendency of cattle to revert to their original habitat (the bush and other cover), who realize to-day what shelter means for the dairy cow. The ordinary post-and-wire fence is about as useful a protection from the hot sun of summer as it is from the cold winds of winter, and to continue to be content with this commonly used class of shelter (?) hardly seems to be consulting one's best interests.

The writer is of opinion that 5 per cent. or more of the area of a farm covered with judicious shelter-belts would ensure more feed and better condition of the stock. Very few farmers object to the cost of the shelter-trees or the labour of planting them. The necessary protective fencing is the stumbling-block. A shelter-belt to be a real protection to stock and pasture must be substantially fenced and maintained, so that at no time of its life can the stock get into it and break down the undergrowth, which nullifies most of its good effects by creating a strong draught of air along the ground, both immediately beneath the trees themselves and well out into the paddock, even on a comparatively still night.

However, much shelter can be given the stock themselves by using short lengths of plantations in L-shaped pieces in the corners against prevailing cold winds, or T-shaped where paddocks and existing fences suit, which take but little land or fencing.

Weeping-willows prove a most useful summer shade, and will grow almost anywhere, about the only difficulty in growing them being the tendency of the cattle to strip the bark off for the first few years. At Tomoana two cement-casks (with ends out) are stood on top of each other round the planted stump, serving the double purpose of preventing the bark being stripped off or being used as a rubbing-post. Ordinary wire netting, 6 ft. by 18 in., wrapped round the cutting and secured with a few small netting-staples makes the bark quite safe. The writer has tried coal-tar for the same object, but it is not so effective and much more troublesome, as one coat is not sufficient.

PRAIRIE-GRASS.

W. S. HILL, B.Agric.

FROM an agricultural viewpoint prairie-grass (*Bromus unioloides*) is the most valuable of the brome-grasses. There are numerous species of brome-grasses, many of the annual forms being regarded as weeds. Of the coarser perennial forms, those belonging to the section *Ceratochloa* are deserving of consideration. Under this head are classed the somewhat synonymous species *Bromus unioloides*, *Bromus Schraederi*, *Bromus pendulus*, and *Ceratochloa pendula*. Other more recently described species are *Bromus pumpellianus*, *Bromus carinatus*, *Bromus pacificus*, and *Bromus polyanthus*. All these are useful agricultural grasses, but the most important in local commerce is *Bromus unioloides*, or prairie-grass.

Recognizing that prairie-grass would in the future play a more important part in intensive farming, some attention has been devoted to this grass at Moumahaki Experimental Farm. It is to the dairyman who requires a nutritious succulent grass which is available during the winter months that prairie-grass will be of most value. During the summer months it does not show to such great advantage, but once the winter approaches its presence in pasture is shown by the bright-green upright growth. The rapidity of this growth is remarkable, especially in cases where the grass is mown. Why, then, is this valuable winter grass not more widely cultivated? For the most part prairie-grass happens to be growing in a hedge, and from there seed reaches a pasture. If sown in a pasture mixture is it given a chance of establishing itself? Is the average commercial sample of this grass altogether satisfactory? Attention has been given to these two aspects: (1) The sowing and management of prairie-grass pastures; (2) the production of an improved strain of prairie-grass.

Prairie-grass as a constituent of a pasture is usually regarded as purely temporary. This is apparently a popular misconception often based on mismanagement. The permanence of this grass is governed by several factors. Being of a ranker growth and of more succulent nature than cocksfoot, crested dogstail, or such grasses common to pasture, it cannot be grazed quite so bare without causing injury. When any grass is sown in only small

quantities in a mixture and the grass is relished by stock more than the other grasses, excessive attention is paid to it. The natural result is that it is kept very close, and is sometimes even exterminated if heavily stocked. This is what often occurs with prairie-grass. Sown in quantities ranging from 20 lb. to 30 lb. of good seed per acre it would form the dominant constituent of a pasture during the winter months. Moderately heavy stocking with cattle and sheep has not harmed prairie-grass at Moumahaki nearly to the extent such stocking is usually supposed to do.

HEAD OF ORDINARY TYPE AFFECTED WITH SMUT.—LEFT.
HEAD OF MOUMAHAKI NO. 6 UNAFFECTED.—RIGHT.

Two fields have retained an abundance of plants and have yielded well after three years' grazing. Seed is being propagated from plants found growing in neighbouring fields which have been grazed by sheep for nine years. Any further selections in this direction would be welcome if forwarded to Moumahaki. In grazing it is considered advisable to do so in small areas heavily stocked for short periods, with intervening periods of rest. A new succulent growth is thus frequently obtained, and the plants do not suffer so greatly from being damaged below the growth-points. A great yield of succulent fodder may be obtained during winter and early spring by cutting prairie-grass and occasionally top-dressing with nitrate of soda.

During the autumn of 1912 a field at Moumahaki was sown with prairie-grass, 20 lb. of seed being used with 10 lb. of lucerne-seed. This was cut for hay and subsequently heavily stocked. The prairie-grass is predominant during the winter months and is still holding well.

Much difficulty is oftentimes experienced in sowing the seed of prairie-grass through the grain-drill. This may be accomplished by

mixing the seed with the fertilizer and sowing through the fertilizer-box. The size of the seed requires that it should be sown well under the soil, not lightly covered as is the practice with most grass-seeds and clovers. To ensure this it is probably the best practice to either broadcast the prairie-grass just after ploughing or disk or harrow in the seed before firming too much with the roller. This will effectually cover the majority of the seed, which will be ready to germinate by the time other grasses and clovers are sown on the rolled surface.

It has long been noted among grasses and other plants that individuals and strains bred from individuals exhibit distinct con-

Bromus unioloides B. Bromus, Moumahaki No. 6. *Bromus unioloides* A.

IN THE TESTING-PLOTS AT MOUMAHAKI.

stitutional characteristics. Many agricultural crops are now being inspected in search of individuals showing greater vitality, which frequently ensures greater production and resistance to fungoid disease. Fortune favoured the search for an improved type of prairie-grass. The numerous single-plant selections made in the locality were finally reduced to eight. The produce of these eight individuals was tested in rows. This showed that No. 6 was outstanding from the rest in its robustness and in its freedom from the attacks of brome-smut (*Ustilago bromivora*). All other selections were then eliminated, and No. 6 has been reproduced

to the fourth generation, of which there is now the produce of over 9 acres.

The selection "Prairie-grass, Moumahaki No. 6," is self-fertilized when the panicle is quite immature. The minute proportions of the inflorescence and the tenacity with which the outer glumes hold together render perfect this self-fertilization. It was thought that this to some extent may account for the freedom of the strain from infection; but several mature seeds were artificially covered with smut-spores and sown in pots, and in no instance did infection take

Bromus unioloides A. *Bromus unioloides B.* Bromus, Moumahaki No. 6. *Bromus unioloides* C.

ANOTHER TEST.

place, and normal seeds were produced. In the second generation two plants were found in the field plot affected by smut, but no others have since been observed, although closely sought after. Should this strain retain its character of a high degree of resistance to smut, in future generations its value will be enhanced, as brome-grass smut is becoming more prevalent in the locality. Referring to brome-grass smut, D. McAlpine, in "Smuts of Australia," says, "It is also sometimes very bad in the prairie-grass, not only destroying the grains but even the base of the glumes. In the early part of

1907 the attack was particularly severe, and in some paddocks of this grass every plant was infected. In 1908 it became something of the nature of an epidemic, and this splendid winter fodder grass, the seed of which is now on sale in Britain for this purpose, was being badly affected in various districts of Victoria where it forms the principal pasture." In referring to infection Professor McAlpine says, "When seed is sown with adherent spores infection readily occurs, and in a favourable season the smutted seed produced plants in which not a single one escaped the disease. In this instance the seed was not artificially infected, but just as it was received from

BROMUS, MOUMAHAKI NO. 6, AT THE RUAKURA FARM OF INSTRUCTION.

the seedsman, and it shows how efficient this mode of infection must be in this particular species of smut."

In order to determine in what species of brome the Moumahaki selection could be classified, the Biologist, Mr. A. H. Cockayne, forwarded a specimen of it to the Director of the Royal Gardens, Kew. This authority described it as "a luxuriant form of *Bromus unioloides*."

The robustness referred to has so far remained outstanding in comparison with the commercial samples experimented with, as may be seen by the accompanying illustrations.

Comparative Yield of Bromus unioloides *Selections.*—Sown the 11th July, 1914. Total of three cuttings to 23rd February, 1915

(Yields based on 100 for commercial samples): Average of three hand-picked samples No. 6 prairie-grass, 183; average yield of three hand-picked samples prairie-grass, 120; average of two commercial samples prairie-grass, 100.

The plants produced from the No. 6 strain exhibit a larger percentage of leaf and are later in the flowering period than those from other samples.

The following is the Biologist's report on a hand-picked sample of prairie-grass, Moumahaki No. 6: "The sample of prairie-grass, 'Moumahaki No. 6,' has shown an average germination-capacity of 98 per cent. The following is the germination-energy of the seed: In three days, 19 per cent.; in five days, 53 per cent.; in seven days, 75 per cent.; in eight days, 82 per cent.; in eleven days, 93 per cent.; in fourteen days, 95 per cent.; in seventeen days, 96 per cent.; in twenty-one days, 98 per cent."

Owing to ripening somewhat unevenly the seed crop requires harvesting at a period when the ripest seed begins to shake. A maximum of good seed is thus obtained.

It is not claimed that the improved form of prairie-grass represented in Moumahaki No. 6 by any means represents all that can be done in the selection of prairie-grass. The selected strain, it is hoped, will serve as a basis for further improvement, which improvement may be well brought about by co-operative effort on the part of farmers and others.

PRAIRIE-GRASS, MOUMAHAKI No. 6, AT RUAKURA.

A. W. GREEN.

THE Moumahaki selection of prairie-grass was sown at the Ruakura Farm of Instruction on the 15th October, 1914, in a strong, well-cultivated plot of land in the nursery. The soil is a heavy loam, and the subsoil a white clay. The manure used was 1½ cwt. of basic superphosphate per acre. The germination was slow, owing to the dry condition of the soil, but the first rains started the young seedlings, and a good stand was obtained.

The variety is very robust, making an abundance of leafage, and producing exceptionally heavy heads. The plot was photographed in full head on the 22nd February, 1915, the photograph being herewith produced. The present height averages 3 ft. 3 in.

No sign of rust is visible on the leaves, and smut is totally absent. The strain of *Bromus unioloides* grown at Ruakura closely resembles the Moumahaki strain in every way, except that the spikelets of the latter are broader and the seed heavier. Three other strains which have been growing here for some years under the names of *Bromus giganteus*, *Bromus pumpellianus*, and *Bromus carinatus* also closely resemble Moumahaki No. 6.

In seed-production the new strain promises to yield heavier than any other, but in amount of foliage it is not ahead of *Bromus pumpellianus*. This may be due to late sowing, for the weather was against it. Taking this into consideration, it is a striking feature that the plants flourished so well during the end of November and December, finally producing an excellent crop.

SILVER-BEET.

COMPARATIVE PALATABILITY TEST OF FIVE VARIETIES.

PRIMROSE McCONNELL.

An experiment to test the relative palatability of five varieties of silver-beet was carried out at the Ruakura Farm of Instruction in January. The varieties under test were: Giant Lucullus, Silver Ribbed Curled, Silver Ribbed, Scarlet Ribbed, and Yellow Ribbed. Silver Ribbed is the variety usually recommended as being the most palatable, and, on the whole, giving the best results.

The area under experiment was 1 acre, and the silver-beet was sown to replace chou moellier, which had germinated very badly. A number of the chou moellier plants survived the cultivation-work necessary before sowing the silver-beet, and this made the experiment doubly interesting. The silver-beet was sown on the 3rd October with the double ridger, the rows being 27 in. apart, the plants being afterwards singled out to 12 in. apart in the rows. The manures applied were 336 lb. superphosphate and 224 lb. bonedust per acre.

Sixty sheep were put on the plot on the 23rd January, thirty of which were two-tooth Lincoln-Romney wethers and thirty dry ewes of the same cross. The wethers were accurately weighed before being turned in and immediately the experiment was finished When they were turned in the total weight of the sheep was

3,484 lb., and when taken off 3,366 lb., a total loss in weight of 118 lb. being thus shown, or an average loss of nearly 4 lb. per wether. The experiment lasted eleven days, and, with the exception of one wet day, the weather-conditions were ideal.

Although the chou moellier was much too mature for sheep-feed, the foliage was at once eaten eagerly, while for the first four days the silver-beet was ignored, and never at any time eaten with apparent relish.

Of the five varieties, it was at first thought that a preference was shown for the Silver Ribbed, but at the end of the experiment the Scarlet Ribbed was the most closely eaten, while the Yellow Ribbed seemed least relished of all.

When taken off, the sheep looked blue of their coats, and all had been more or less purged. The result of the experiment only goes to confirm the writer's previous experience with this forage plant as far as sheep are concerned, and all reports to hand from private experimenters in the North Island are of a similar nature—namely, that as a sheep-fattener it is of little or no value, and for lambs is absolutely detrimental.

It may be of some value as a cow-feed, but, even so, it requires the addition of hay, or the cows must have access to a dry old pasture. Even cows do not relish it, and will refuse to eat it when other green feed is procurable. It must be remembered that the above conclusions only refer to the North Island.

To Grass Rough Places.—Those who desire a good grass for hill-tops and one to grow in gullies and rough places in high country should try *Danthonia pilosa*. On broken country poorly grassed in the first place or which has been subsequently overstocked and where top-dressing is out of the question the use of danthonia is specially advisable. A distinct advantage of this native grass is that when it becomes too coarse for grazing it can be burnt off, when a fresh young growth will come away again in the spring. Especially is this method serviceable where the danthonia is growing in gullies among fern and other rough material, as the burning clears away all this ideal covering for rabbits. When the grass becomes overgrown cattle can be turned on to it. These usually thrive on the feed. In the late autumn, when danthonia is too coarse even for cattle, the burning can take place. In sowing the danthonia, which should be at the rate of 6 lb. to the acre, the seed may be thoroughly mixed with a clean chaff. This will enable the effective distribution of a seed which is very difficult to sow when used by itself. Great care is necessary to secure a thorough mixing of the seed and the chaff. Not more than about a shovelful should be mixed at the one time.—*W. Dibble.*

THE FARMER'S ORCHARD.

WILLIAM C. HYDE.

AFTER inspecting a very large number of farm-orchards in all classes of country, a few notes on the experience of the more successful may interest those who are less fortunate or who are establishing homes in new settlements.

The bulk of the literature on fruitgrowing is elaborate and intricate, and, while of great value to the commercial grower, is apt to discourage the farmer who has neither time nor inclination to either study or put into practice all the operations necessary to fulfil the exacting demands of the commercial side of the business. Very many instances demonstrate the fact that quite simple methods when carefully followed will keep the farmer's household well supplied with the produce of the orchard. The following is an outline of some of these methods :—

1. As in other enterprises, a good start is perhaps the most important factor to success. "I bought these trees at an auction sale. They were a few unsold bundles of unnamed varieties. I got them for 3d. each," is a statement one constantly hears. And again, "Would you come and see my orchard? I have some trees that are not doing well." One or two unsatisfactory specimens are pointed out, and it is explained that they have received the same treatment as the most successful. Examination may reveal no disease whatever, but when the owner is asked if they were ever good trees, the answer is often, "No; they were culls to begin with." Even the more cautious farmer, who makes inquiries before purchasing, often makes mistakes. He is told that Sturmer, Jonathan, and Cox's Orange Pippin are amongst the best varieties of apples, which is quite true, but they require the constant and skilful attention of the commercial grower to make those choice qualities manifest. Certainly under average farm conditions they are only partially successful, if not quite unsatisfactory. To establish a good farm-orchard the varieties selected should be naturally vigorous, natural spur-bearers, blight-proof as nearly as possible, while the quality and quantity of the crop must be satisfactory. In making this selection, local experience is the best basis upon which to build. The Orchard Instructor for the district is one who is in a position to have a good stock of this commodity and who will place it at

the disposal of all inquirers. The apples Gravenstein, Delicious, Emperor Alexander, Alfriston, Mobb's Royal, Northern Spy, Prince Bismarck, Reinnette du Canada, Stayman Winesap, and Yellow Bellefleur have most of the qualities mentioned above, and are among the most useful for our present purpose. Varieties of pears and plums are generally better selected, a satisfactory choice being more easily made. Place the order with your nurseryman early in the season for early delivery, ordering strong, shapely plants, and remembering that to plant culls with the expectation of their "catching up" is a delusion.

2. The orchard-site and shelter-belt is fully dealt with in the departmental Bulletin No. 14 (New Series). Invariably the model farm-orchard is found with a warm and cosy wind-break. Sometimes the hot north winds are filtered through a cool break of poplar foliage. A substantial shelter for the whole homestead is far better than high shelter round a small section, as is sometimes seen. Such fruit-trees as have been referred to should be planted at least 20 ft. apart. The method of pegging out the ground for planting is given in detail in the leaflet before referred to. That some farmers omit the ploughing and subsoiling of the ground for the orchard is a fact of which there is ample evidence, and this demonstrates that it is not impossible for the trees to flourish and bear fair crops without these procedures, other things being right. While the thorough preparation of the land is necessary where high quality and large quantities are required for commercial purposes, fair and useful results may be obtained in the farm-orchard by the simpler system, providing the right varieties of fruit are selected and the quality of the land, the rainfall, and shelter are right.

Following this course, then, the most successful method has been to thoroughly dig and cultivate around each planting-peg to a distance of 3 ft., thus forming a circle 6 ft. in diameter. Plant the tree where the peg stands, as described in Bulletin No. 14, and on the circumference of the circle before mentioned drive six stakes equidistant from one another. Enclose them with wire netting that is hare-proof, using as fastening any of the devices employed when erecting wire netting to fold sheep on turnips, in order that it may be readily removed and replaced when pruning, cultivating, &c.

While apples, pears, plums, &c., may be treated in this way, peach-trees and berry-bearing bushes should be planted in the vegetable-garden, and so get continuous cultivation. Very rarely is any other treatment successful.

3. To then cut the branches of the newly planted tree hard back to make it "stool out" is the third important and indispensable factor for the success of the farm-orchard. This should be done each winter for three or four years till a broad-based, sturdy

foundation is established. Details of this operation will be found in the leaflet already referred to.

4. While buckets and a bucket pump are suitable for the little spraying required for the first few years after planting, such an outfit quickly becomes inadequate for a farmer's orchard, and persistence simply means that the work gets neglected or indifferently performed—which is worse. The smallest practicable outfit would be a barrel pump—a strong oak barrel in which a good pump of standard make has been fitted, a generous length of high-pressure hose, and a bamboo directing-rod; the whole concern being mounted on a sledge or truck so that it may be drawn by a horse. Such will not only do first-class work, but will economize material, time, and patience. Such an outfit is also suitable for spraying the potato-patch, whitewashing sheds, &c. A horse pulling 25 to 50 gallons of spray on a truck is a much better proposition than using a bucket brigade to maintain the supply, not to mention the advantage in efficiency of the pump of higher pressure.

5. A fruit-tree that has been transplanted and probably transported some distance requires a deal of consideration if good results are to be obtained. Besides that mentioned above, a tree should be liberally treated, particularly during the first few years of its orchard existence. At the end of winter and during spring and early summer, while the tree is making its growth, is the time for manures to be applied, unless their action be slow, when earlier application in winter is advisable. Most farmers will have a good idea of the manures required to get vigorous tree-growth on their land. Well-decayed manure from the stables, stockyard, or sheep-pens is generally effective, and is often the best.

6. During the important years above referred to cultivation of the area enclosed round each tree is necessary throughout the summer and autumn months. This may be done with a large sharp push-hoe, or the land may be skim-dug to a depth of 2 in. or 3 in. with a sharp spade. Never after planting should the land be deeply dug about a tree. Frequent cultivation will ensure the complete assimilation of the manures applied, retard evaporation of moisture, maintain a more even temperature of the soil, and destroy weeds—the main factors necessary for strong, clean tree-growth.

7. A word or two on storing the fruit crop will be useful to some farmers. Stone-fruits are too perishable to store in the usual sense of the term. Sterilization in an airtight bottle container or can is practically the only method of keeping these for any length of time. On the other hand, pip-fruits—apples and pears—may be kept for considerable periods under right conditions. To spread a layer of apples or pears of various varieties and conditions on straw

on a floor or shelf in a shed is not a suitable method of storing fruit in this country. In fact, we shall eliminate most of our difficulties here right away if we remember that *there is no practical method of storing successfully blemished or diseased fruit, or sound fruit either if mixed with these.* The pickers should cull out such fruit when picking, casting it towards the foot of the tree, where it can afterwards be put to immediate use. The balance of the crop is often stored in large cases under evergreen trees—a very good rough-and-ready method for the farm in this country, though it has drawbacks. Vermin of many kinds are likely to bring about depreciation of the plant, while goods stored in bulk in big cases are not easily supervised.

Those who would give this matter a little more attention are advised to use a strong case holding about a bushel. Benzene-cases open on the broad side, with a couple of broad cleats tacked on the ends to lift by, are very suitable. These may be taken into the orchard and filled straight from the picker's bag or bucket. When three-parts filled they can be stacked in a dray and carted to the storing-depot. Here, if the culling in the orchard has been good, all that is needed is to stack them again in a systematic manner as high as is convenient. The advantages of a moderate-sized box are that it can be taken about the orchard, thus saving an extra handling of the fruit; and, further, the fruit is better able to be classified and supervised while in store; it economizes space by enabling more overhead room to be used, and at all times it is a quicker and less damaging method of handling. Instead of resorting to all sorts of little contrivances to avoid the depredations above referred to, if a wooden shed with a clay or concrete floor and sufficient ventilation enclose the fruit-stack under the trees, the disturbing levies mentioned above will be prevented in a manner that is effective, neat, and convenient.

The 1914–15 season has been exceptionally favourable for clearing new country of timber by means of fire. The average area that has been annually converted from bush to grass—250,000 acres—has this season been considerably exceeded. The outstanding feature in this operation has been the exceedingly high price of the staple grass-seeds employed—cocksfoot and rye-grass. Other grass-seeds used for bush country, except that of white clover, have not been unduly high in price, and this has led to the more extended use of varieties such as crested dogstail, *Poa pratensis*, *Poa trivialis*, and meadow-foxtail, an amendment in procedure that will assuredly be to the ultimate benefit of the pastures, provided, of course, seed of the main grasses has not been foolishly stinted by reason of its increased cost.—*A. H. Cockayne.*

A DANGEROUS POTATO-DISEASE.

A. W. GREEN.

A DISEASE in potatoes which has not exhibited itself to the same extent as in the present season, and is fairly general in the Waikato, is a wilting of the haulm, which causes the potatoes to ripen off fully three weeks before they should do. This wilting is due to root-failure. The first sign of the wilting is a yellowing of the foliage, a large development of buds in the axils of the leaves, these often swelling to such an extent as to form small tubers on the stem. The leaves become yellow at the base of the stem, and the tips of the leaves at the top of the stem turn a reddish-yellow and become curled or incurved. The branch-stems easily break away from the main stems. If the root is pulled up it is found that the roots are decaying, and the underground stems which attach the tubers to the haulm also rot away, leaving the tubers in an unmatured state. Generally the disease has the effect of premature ripening, and, consequently, the production of undersized tubers. A white mildew is frequently found on the soil just where the stem grows below the surface of the soil, though on some affected specimens mildew appears on the stem above the soil-surface. In some instances the tubers become soft and spongy. It takes all varieties. A strong-growing variety, such as Commercial, is even attacked more badly than a variety with a weaker top, such as Runciman's Purple. Southern Cross, a blight-resisting variety, is also subject to the trouble. In a row of Commercial over 100 yards long at Ruakura Farm of Instruction there is not an unaffected plant. While the plants are either completely or partially attacked, the tubers themselves are little affected, except in the occasional instances where they become soft and spongy, this being general where the disease had attacked the plants in their early growth.

THE DISEASE DESCRIBED.

A. H. COCKAYNE.

The fungus known as *Rhizoctonia violacea* is widespread in New Zealand. It attacks many different farm crops, but its ravages are most pronounced on potatoes. At times it causes a very

AFFECTED HAULM SHOWING THE CURLING OF THE LEAVES.

serious diminution in the crop, but generally its effects are not sufficiently serious to command the farmer's attention. When, however, the majority of the crop becomes affected the damage is generally attributed to unfavourable climatic and cultural conditions, the fungal nature of the disease being often overlooked.

Even at the present time there is considerable doubt expressed by plant pathologists as to whether *Rhizoctonia* is the real cause of the disease in potatoes, or whether it is sometimes accompanied with other fungi that are really the cause of the trouble. This uncertainty is largely due to the fact that certain stages of the development of the fungus, notably the sclerotium stage on the tubers themselves, are often present in a crop that otherwise appears perfectly healthy and produces an abundant yield. At other times the presence of *Rhizoctonia* results in the production of only a small crop, and most of the tubers do not develop beyond the size of marbles before the tops wither away. An affected crop can generally be recognized by the partial failure of certain of the sets to develop. The haulms may reach the surface of the ground, but they soon rot below the ground-level, and blanks are then present scattered through the crop. If the haulms do appear to be developing normally they soon become more or less rosetted and thickened, and growth is then extremely

AFFECTED PLANT SHOWING FUNGAL DEVELOPMENT NEAR THE GROUND-LEVEL.

slow. A very regular feature is the production of aerial tubers in the axils of the leaves, and this phenomenon is a sure indication that the plant is affected. In many cases a rotting of

PARTIALLY MATURED TUBERS OF AFFECTED PLANT.

the haulms occurs just below ground-level, and the foliage curls up and withers. This withering may not take place until the crop is approaching maturity, but generally isolated plants die

down throughout the growing season. If the haulms of a withering plant are examined it will be often seen that a ring of fungal filaments is present just at the surface of the ground. In the first place these have been developed in the vascular system of the haulms, causing dislocation of the water-supply, and sub-

AFFECTED HAULM SHOWING DEVELOPMENT OF AERIAL TUBER LIKE OUTGROWTHS.

sequently they form a more or less complete matwork of threads round the lower part of the stem. Tubers from affected plants are nearly always covered with small black bodies known as sclerotia, but similar growths are also found on healthy potatoes, so that there is considerable doubt as to whether this stage is

really connected with the parasitic stage developed within the stem.

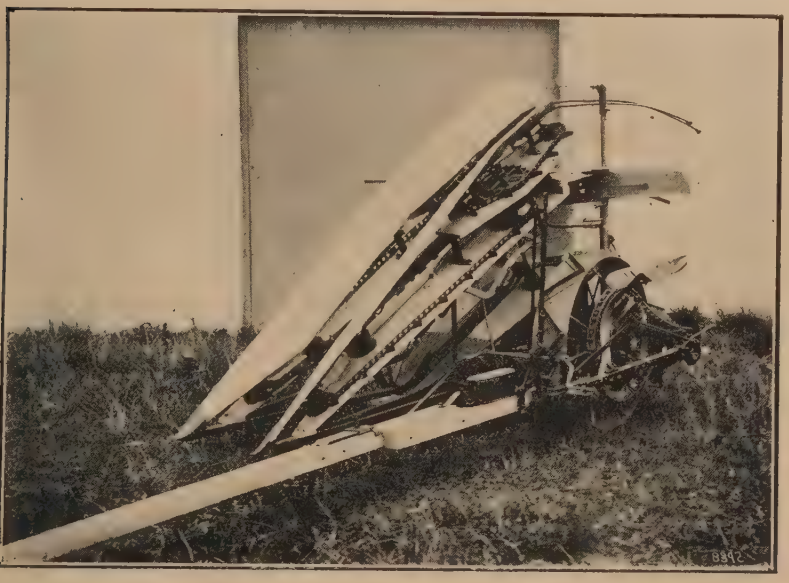
Rhizoctonia is one of the most difficult fungi to destroy, as it is evidently able to change from a parasite to a saprophyte whenever the conditions are unfavourable for its continued infection. It thus may remain in the soil for many years, and whenever a crop is grown that it is capable of infecting it soon makes its presence again felt. Cereals do not appear to be attacked, and land can be employed for such crops and also for mixed grasses without any damage occurring. It is probable that some method of soil-sterilization may have to be adopted in controlling this disease. The recent discovery of the effect of carbolic acid by Dr. Salmon is of importance in this direction. He found that a solution of 1 oz. of carbolic to 40 gallons of water was quite effective, but the ground has to be thoroughly saturated in order for the treatment to be thoroughly successful.

HARVESTING OF MAIZE FOR SILAGE.

AN EFFECTIVE MACHINE.

THE harvesting of maize for silage purposes has been declared to be too costly a process, but this is largely because the heavy growth has had to be cut by hand with a sickle. By using a proper maize-binder, however, the cost is reduced to a minimum. The binder here illustrated does the work most effectively. The great gathering-boards projecting in front of the machine automatically gather in the high maize-stalks, which are then cut by a stout reaping-knife and automatically formed into bundles. These are tied together while in an upright position, the solid bundles being then thrown off the machine to the left and behind the driver and some distance away, so that a clear track is left for the machine on its next round. Practical demonstrations with this machine on the property of Messrs. Saunders Bros., Shannon, clearly proved that a well-grown crop of maize can be harvested in practically the same time as can any other plant; indeed, when the weight of feeding-material handled is considered it may be said that by harvesting maize by machinery a greater amount of fodder can be harvested in a given time than is possible with any other crop. Not only does the mechanical harvesting of maize effect great economy in

labour and time, but, most important of all, it enables the process of making silage on a large scale to be carried out in the shortest space of time and with the desired efficacy, as such a big mass of material can be chaffed and blown into the silo without interruption that the necessary weight to obtain the proper temperature may be secured, as it should be, within a few hours. This would enable the work of filling the silo to be done between milkings by the owner and a couple of assistants; whereas without the aid of the special binder, and having to employ a number of extra hands and keep these going, the filling of the silo is a difficult problem, as if the



hands are kept going all day too much weight of material is added. This has the effect of checking the temperature of the bottom layer, and time has to be therefore allowed for the heat to rise to the necessary 130° F. before more material can be added, and this may mean a delay of two days or even more, according to the condition of the crop. If the maize is on the succulent side an increase of temperature is slow, while if it is on the ripe side the heat increases much more rapidly and makes the control of temperature more difficult.

This maize-binder was imported from America at the suggestion of the Department by Messrs. A. Burgess and Son, Palmerston North.

THE APPLE JONATHAN.

W. H. TAYLOR.

ONE of the most popular apples as an apple, and also as a commercial proposition, is Jonathan. At the present time many growers are losing faith in it, and prospective orchardists are hesitating to plant it. The cause of this hesitancy is a belief, which is becoming widespread, that it is a short-lived tree. Some go as far as to say that it is a failing tree after about twelve years from planting. I am one of the few who lose no opportunity of combating this idea. I am confident that in most cases Jonathan trees are wrongly treated, and that this is the cause of early failing. My belief is strengthened by the knowledge that other varieties, not considered to be lacking in stamina, fail early under similar treatment. The cause of the trouble is mainly due to the drooping form the tree is allowed to assume. The natural growths of the Jonathan are of a rather weak order. They are seldom robust. Like many others it inclines to bear fruit far out on slender shoots, and if it is allowed to do this the result is a weeping tree. The weight of fruit borne in improper positions bears down the branches, the consequence being a general check to the flow of sap and an ever-weakening tree. I am among the few previously referred to who believe this to be at least the chief cause of the trouble. When the Jonathan is grown as upright as possible it is a quite different tree. It becomes fairly vigorous, bears well, and at the same time makes good growth. The aim of the pruner should be to send the main branches upwards and slightly outwards in as direct a line as possible; the fewer angles the better. Bearing-wood should be most plentiful on the inner side of the branches, so as to counteract the tendency to spread. I have proved this to have great influence on the vigour of the tree.

I was induced to write these notes by an article in *The Garden*, on "Apples and Pears; their Flavour and Pedigree." The article is one of a series telling what is known of the origin of certain varieties. The writer shows that the best-known varieties of merit are the work of nature, and are not due to artificial breeding. The Jonathan apple was found in a wild corner of the farm of Philip Rick, in Ulster County, New York, among

the foothills of the Catskill Mountains. No one could account for its origin. The writer says it was still living after it had been known to have been bearing fruit for twenty-five or thirty years. It appears, therefore, that the original Jonathan was not a weakling.

INTERPOLLINATION OF FRUIT-TREES.

THE reports of the individual observers who co-operated with the Orchards, Gardens, and Apiaries Division of the Department in regard to the flowering period of the various varieties of apple and pear trees are herewith concluded with the reports on the pear varieties.

The name of the observer, the variety, and the flowering period are as follow :—

Variety.	Flowering Period.	Variety.	Flowering Period.
J. W. Collard, Orchard Instructor, Whangarei.			
Vicar of Winkfield ..	10 Sept.–15 Oct.	Beurré Diel	19 Sept.–17 Oct.
Williams's Bon Chrétien ..	24 Sept.–28 Oct.	,, ...	18 Sept.–17 Oct.
,, ..	21 Sept.–25 Oct.	,, ...	16 Sept.–18 Oct.
,, ..	25 Sept.–24 Oct.	Williams's Bon Chrétien ..	21 Sept.–26 Oct.
C. W. Mitchell, Whangarei.			
Williams's Bon Chrétien ..	25 Sept.–27 Oct.	Beurré Diel	21 Sept.–19 Oct.
Retei Seedling	10 Sept.–16 Oct.	Clapp's Favourite ..	14 Sept.–10 Oct.
Louise Bonne of Jersey ..	14 Sept.–14 Oct.	L'Inconnue	21 Sept.–16 Oct.
Vicar of Winkfield ..	14 Sept.–10 Oct.		
W. C. Thompson, Orchard Instructor, Avondale.			
Beurré Diel	24 Sept.–14 Oct.	Winter Nelis	20 Sept.–12 Oct.
Winter Cole	24 Sept.–14 Oct.	Kieffer's Hybrid	10 Sept.– 2 Oct.
Williams's Bon Chrétien ..	30 Sept.–21 Oct.	Jargonelle	6 Sept.–30 Sept.
Vicar of Winkfield ..	20 Sept.–10 Oct.	Doyenne du Comice ..	26 Sept.–16 Oct.
P. Barry	18 Sept.– 9 Oct.	Winter Bartlett	22 Sept.–12 Oct.
Beurré Clairgeau	18 Sept.– 9 Oct.	Conference	26 Sept.–16 Oct.
Beurré Bosc	18 Sept.–14 Oct.	Louise Bonne of Jersey ..	18 Sept.– 7 Oct.
E. Morrison and Sons, Warkworth			
Beurré Berckmans ..	20 Sept.– 9 Oct.	Lexington	28 Sept.–21 Oct.
Conference	27 Sept.–23 Oct.	Le Lectier	23 Sept.–29 Oct.
Beurré Hardy	21 Sept.–18 Oct.	Lawson	21 Sept.–20 Oct.
Beurré Fouqueray ..	24 Sept.–18 Oct.	Windsor	28 Sept.–21 Oct.
Beurré de Jonghe ..	25 Sept.–15 Oct.	Kozou	18 Sept.–22 Oct.
Passans de Portugal ..	25 Sept.–19 Oct.	Koonce	22 Sept.–20 Oct.
Beurré d'Anjou	15 Sept.– 3 Oct.	Duchess d'Angoulême ..	26 Sept.–18 Oct.
Beurré Alexander Lucas ..	21 Sept.–13 Oct.	Bountiful	16 Sept.– 8 Oct.
Nouvelle Merveille ..	18 Sept.–11 Oct.	Easter Beurré	26 Sept.–15 Oct.
Ne Plus Meuris	16 Sept.– 8 Oct.	President Drouard ..	27 Sept.–21 Oct.
Awauki	1 Oct. –27 Oct.	Gansel's Bergamot ..	24 Sept.–26 Oct.
Ansault	26 Sept.–20 Oct.	Williams's Bon Chrétien ..	28 Sept.–22 Oct.
Maréchal de Cour	18 Sept.– 4 Oct.	Souvenir du Congres ..	24 Sept.–18 Oct.
Margate	18 Sept.– 1 Oct.	Packham's Triumph ..	28 Sept.–22 Oct.
Professor Barral	19 Sept.– 6 Oct.	Doyenne du Comice ..	28 Sept.–19 Oct.
Zepuirin Gregoire	25 Sept.–15 Oct.	Passe Colmar	27 Sept.–19 Oct.
Taihie	4 Oct. – 1 Nov.	Bishop's Thumb	29 Sept.–24 Oct.
Dr. Jules Guyot	27 Sept.–19 Oct.	Beurré Bosc	26 Sept.–20 Oct.
Superfine	26 Sept.–18 Oct.	Madam Lang	18 Sept.– 5 Oct.
Black Worcester	20 Sept.–16 Oct.	Lincoln Coreless	22 Sept.–20 Oct.
Directeur Hardy	24 Sept.–10 Oct.	B. C. Bonamour	24 Sept.–14 Oct.

Variety.	Flowering Period.	Variety.	Flowering Period.
E. Morrison and Sons, Warkworth—continued.			
Colonel Wilder	26 Sept.–18 Oct.	Bessamianka	25 Sept.–16 Oct.
Sheldon	26 Sept.–18 Oct.	Sand	23 Aug.–26 Sept.
Seckel	20 Sept.–12 Oct.	Howell	13 Sept.– 5 Oct.
Brown Beurré	23 Sept.–21 Oct.	Le Conte	31 Aug.–26 Sept.
Broompark	21 Sept.–10 Oct.	Lawrence	14 Sept.– 5 Oct.
Summer Compôt	19 Sept.–15 Oct.	Beurré d'Amanlis Panachée	15 Sept.–10 Oct.
Beurré Montellet	17 Sept.–10 Oct.	Louise Bonne of Jersey	19 Sept.–16 Oct.
Princess	21 Sept.–13 Oct.	Beurré Rance	18 Sept.–12 Oct.
Pitmaston Duchess	30 Sept.–24 Oct.	Beurré Diel	24 Sept.–22 Oct.
Winter Cole	27 Sept.–19 Oct.	Vicar of Winkfield	18 Sept.–16 Oct.
Winter Bartlett	28 Sept.–20 Oct.	White Doyenne	16 Sept.– 9 Oct.
Wilder Early	26 Sept.–16 Oct.	Glou Morceau	27 Sept.–22 Oct.
Huyshes Victoria	26 Sept.–20 Oct.	Beurré Capiaumont	18 Sept.–16 Oct.
Foudante de Thirriot	23 Sept.–17 Oct.	L'Inconnue	20 Sept.–20 Oct.
Verulam	23 Sept.–17 Oct.	Poir de Berriags	4 Sept.– 4 Oct.
Urbaniste	16 Sept.–10 Oct.	Jargonelle	12 Sept.– 9 Oct.
Foudante d'Automne	27 Sept.–21 Oct.	Dunmore	12 Sept.– 8 Oct.
Engewood (perhaps same as Broompark)	21 Sept.–10 Oct.	Beurré Clairgeau	14 Sept.–13 Oct.
		Cluster	13 Sept.–13 Oct.
Emile d'Heyst	27 Sept.–19 Oct.	Kieffer's Hybrid	4 Sept.– 2 Oct.
Triomphe de Vienne	24 Sept.–16 Oct.	Duchess d'Orleans	29 Sept.–22 Oct.
Triomphe de Jodoigne	19 Sept.–18 Oct.	Fertility	14 Sept.– 8 Oct.
Durondeau	20 Sept.–16 Oct.	Brockworth Park	1 Sept.–28 Sept.
Bergamot Sapieschanka	25 Sept.–14 Oct.	P. Barry	10 Sept.– 6 Oct.
Madame Cole	26 Sept.–20 Oct.	Garber's Hybrid	15 Sept.– 3 Oct.
Dempsey	16 Sept.–11 Oct.	Beacon	14 Sept.–10 Oct.
Flemish Beauty	16 Sept.–16 Oct.	St. Michel Archange	10 Sept.– 4 Oct.
Griveau	28 Sept.–22 Oct.		
T. E. Rodda, Orchard Instructor. (*Observed in P. Going's Orchard, Claudelands.*)			
Beurré Diel	11 Sept.– 2 Oct.	Fertility	16 Sept.– 2 Oct.
W. Causeley and Son, Parawai (*Thames*).			
Williams's Bon Chrétien	25 Sept.– 2 Oct.	Packham's Triumph	20 Sept.–30 Sept.
P. Barry	7 Sept.–25 Sept.	Louise Bonne of Jersey	20 Sept.–30 Sept.
Beurré Diel	25 Sept.– 3 Oct.	Kieffer's Hybrid	7 Sept.–25 Sept.
W. Causeley and Son, Totara (*Thames*).			
Williams's Bon Chrétien	27 Sept.– 5 Oct.		
A. M. Robertson, Mahora.			
Williams's Bon Chrétien	17 Sept.– 5 Oct.	Beurré Clairgeau	10 Sept.–20 Sept.
P. Barry	13 Sept.–26 Oct.	Beurré Capiaumont	15 Sept.–28 Sept.
W. F. Wishart, Pakowhai.			
Louise Bonne of Jersey	17 Sept.– 1 Oct.	Beurré Diel	20 Sept.– 5 Oct.
Williams's Bon Chrétien	24 Sept.– 8 Oct.	Beurré Clairgeau	17 Sept.– 1 Oct.
S. Watson, Havelock North, H.B.			
Kieffer's Hybrid	6 Sept.–20 Sept.	Williams's Bon Chrétien	20 Sept.– 7 Oct.
P. Barry	10 Sept.– 1 Oct.	Winter Nelis	23 Sept.– 9 Oct.
Beurré Clairgeau	14 Sept.–28 Sept.	L'Inconnue	22 Sept.– 9 Oct.
Josephine de Malines	7 Sept.–29 Sept.	Doyenne du Boussch	22 Sept.–10 Oct.
Doyenne du Comice	21 Sept.– 5 Oct.	Harrington's Victoria	22 Sept.– 9 Oct.
Beurré Superfine	21 Sept.– 5 Oct.	Fertility	20 Sept.– 9 Oct.
Conference	20 Sept.– 5 Oct.		
F. Cook, Hastings.			
Winter Nelis	25 Sept.– 4 Oct.	Beurré Clairgeau	20 Sept.–30 Sept.
Louise Bonne of Jersey	20 Sept.– 1 Oct.	P. Barry	20 Sept.– 1 Oct.
Williams's Bon Chrétien	29 Sept.–10 Oct.	Beurré Diel	29 Sept.– 8 Oct.
W. T. Benefield and Sons, Aramoho.			
Williams's Bon Chrétien	24 Sept.– 8 Oct.		
F. W. Smith, Kai Iwi, Wanganui.			
Beurré Clairgeau	7 Sept.–20 Sept.	Williams's Bon Chrétien	17 Sept.– 8 Oct.
Vicar of Winkfield	10 Sept.–25 Sept.	Beurré Capiaumont	14 Sept.–29 Sept.
Shailer and Sons, Hokowhitu Orchard, Palmerston North.			
Petite Marguerite	8 Sept.–15 Sept.	Beurré Rance	12 Sept.–22 Sept.
Kieffer's Hybrid	1 Sept.–22 Sept.	Beurré Clairgeau	12 Sept.–20 Sept.
Louise Bonne of Jersey	8 Sept.–19 Sept.	Williams's Bon Chrétien	18 Sept.–28 Sept.
Vicar of Winkfield	12 Sept.–22 Sept.	Conference	16 Sept.–28 Sept.
Passe Colmar	12 Sept.–22 Sept.	Fertility	16 Sept.–28 Sept.
Beurré Hardy	12 Sept.–22 Sept.	Beurré Bosc	22 Sept.–28 Sept.
Duchess d'Angoulême	12 Sept.–22 Sept.	Beurré Diel	18 Sept.–28 Sept.
Beurré Capiaumont	12 Sept.–22 Sept.		

Variety.	Flowering Period.	Variety.	Flowering Period.
F. H. Outram, Palmerston North.			
Doyenne du Comice ..	13 Sept.– 1 Oct.		
J. Jones, Palmerston North.			
Williams's Bon Chrétien ..	23 Sept.– 3 Oct.	Fertility	20 Sept.– 3 Oct.
Beurré Clairgeau	17 Sept.–28 Sept.	Louise Bonne of Jersey ..	16 Sept.–27 Sept.
Winter Nelis	21 Sept.– 3 Oct.	Vicar of Winkfield ..	16 Sept.–27 Sept.
Winter Cole	21 Sept.– 3 Oct.		
Thomas C. C. Scott, Stoke.			
Williams's Bon Chrétien ..	22 Sept.–13 Oct.	Beurré Clairgeau	1 Oct. –23 Oct.
E. B. Izard, Stoke, Nelson.			
Monchallard	4 Sept.–26 Sept.	Wilder	12 Sept.– 2 Oct.
Twyford Monarch ..	4 Sept.–28 Sept.	Le Lectier	12 Sept.–30 Sept.
Petite Marguerite	4 Sept.–30 Sept.	Williams's Bon Chrétien ..	19 Sept.– 6 Oct.
Leslie Reynolds, Stoke.			
Vicar of Winkfield ..	23 Aug. –20 Sept.	Williams's Bon Chrétien ..	26 Sept.– 3 Oct.
Bishop's Thumb	26 Sept.– 6 Oct.	Kieffer's Hybrid	13 Aug. –20 Sep
Marie Louise	26 Sept.– 6 Oct.		
J. A. Stirling, Waimahaka.			
Blue Belgian	6 Oct.	Beurré d'Amanalis ..	9 Oct. – 1 Nov.
Williams's Bon Chrétien ..	1 Oct. –20 Oct.	Beurré Diel	9 Oct. –23 Oct.

DRY FARMING.

THE chou moellier crop at Ruakura Farm of Instruction, as shown by the illustration on the following page, had no rain between the date of sowing and that on which the photo was taken. A lot of rubbish, consisting principally of stack-bottoms, hedge-trimmings, &c., was ploughed under in the autumn, and the land was again deeply ploughed in the spring, and worked to a fine tilth. The plants received intercultivation during their period of growth, and, although a surface-rooting plant, the crop was little affected by the long drought. The yield was, of course, not so heavy as it would have been under normal weather-conditions.

Those desiring to try prairie-grass, which is highly recommended for winter and spring feed, are advised to see that the germination of the seed they purchase is satisfactory. Owing to the very limited amount of this seed produced during the past two seasons there is a considerable quantity of 1912 seed being offered. The germinating-power of this is very low, and disappointing results must accrue from its use.

CHOU MOELLIER CROP AT THE RUAKURA FARM OF INSTRUCTION.

SEEDS AND THEIR IDENTIFICATION.

E. BRUCE LEVY.

YORKSHIRE FOG (*Holcus lanatus*). Sweet vernal (*Anthoxanthum odoratum*). Meadow-foxtail (*Alopecurus pratensis*).

In structure these three seeds are slightly different from those described in the preceding notes. They differ mainly in not having a rachilla, and in having what are called empty glumes. Each seed has two of these empty glumes attached in addition to the ordinary flowering-glumes. Meadow-foxtail has no palea. Sweet-vernal seed when in the seed-head is surrounded by four empty glumes. Two of these, the two outer, remain attached to the seed-stalk after the seed, with two empty glumes attached, has fallen.

SWEET VERNAL (ANTHOXANTHUM ODORATUM). ENLARGED 6 DIAMETERS.

Sweet vernal and Yorkshire fog, although used by many as constituents of their pastures, must in general be classed as weeds, hence their presence in lines of seeds should be guarded against according to the use to which the seed is to be put. For instance, the presence of Yorkshire fog or sweet vernal in seed when sown on dry hillsides is of little consequence other than from a monetary standpoint in the purchasing of the seed. If, however, the seed employed is being sown on damp soil, then Yorkshire fog

must be classed as a weed-seed, for should a poor strike of the rye-grass, or whatever seed being sown, take place, then the Yorkshire fog will take possession of the pasture, and will finally become the dominant constituent; and when the very poor feeding-

YORKSHIRE FOG (HOLCUS LANATUS). ENLARGED 6 DIAMETERS.

value of this grass is considered the harmful results of sowing on this class of soil lines containing Yorkshire-fog seed should be fully recognized.

GENERAL DESCRIPTION.

Of these three seeds sweet vernal is quite distinct. Yorkshire fog and meadow-foxtail, however, resemble each other to a certain extent.

AVERAGE SIZE OF THE SEEDS.

	Length.		Width.	
	Empty Glumes.	"Shelled."	Empty Glumes.	"Shelled."
Sweet vernal	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{24}$	$\frac{1}{32}$
Yorkshire fog	$\frac{2}{11}$	$\frac{1}{11}$	$\frac{1}{16}$	$\frac{1}{32}$
Meadow-foxtail ..	$\frac{1}{17}$	..	$\frac{1}{14}$	..

COLOUR OF THE SEEDS.

Sweet vernal: Chestnut to a dark brown; awn very dark brown towards base; empty glumes tipped with a very light-straw colour.

Yorkshire fog: Light-straw-coloured; often tinged with a deep lilac.

Meadow-foxtail: Light-straw-coloured; sometimes quite dark; no lilac tinge present; nerves of empty glumes more or less green from about midway to the terminus.

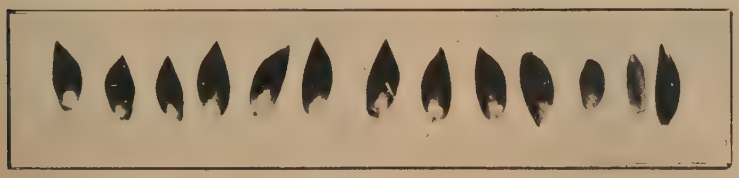
Sweet vernal and Yorkshire fog are found in commercial lines of seed in two different forms—(1) With the empty glumes attached; (2) with only the two flowering-glumes present. When in this latter state the seed is generally called "shelled," although as a matter of fact it is no more shelled than is perennial rye-grass, for in both cases each seed is covered by the same envelopes—viz., the outer flowering-glume and the palea.

SWEET VERNAL.

(1.) *With Empty Glumes attached.*—The two empty glumes of sweet vernal are about equal in size; are boat-shaped, and fairly strongly keeled. They are covered with chestnut hairs, which

MEADOW-FOXTAIL (ALOPECURUS PRATENSIS). ENLARGED 6 DIAMETERS.

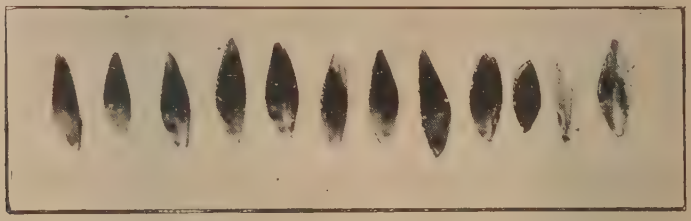
are situated in rows, generally about five, down the glumes. The two glumes do not overlap each other to any extent, and the enclosed seed, when fully mature, is kept in place only by the hairs on the margin of the empty glumes. Each glume has an awn—one is bent and twisted, the other is shorter and straight. Both arise from the back of their respective glumes, and hence



SWEET VERNAL ("SHELLED"); READING FROM THE RIGHT END, OUTER FLOWERING-GLUME, PALEA, AND KERNEL, THE REMAINDER BEING THE ORDINARY "SHELLED" SEED. ENLARGED 6 DIAMETERS.

are called "dorsal awns." The larger awn is dark brown from its base to the bend, thence to the end it is a much lighter colour.

(2.) "*Shelled.*"—Sweet vernal when shelled is a light-brown colour, is smooth and fairly shiny. The two flowering-glumes adhere very closely to the kernel, and are hardly discernible. Neither of them is awned.



YORKSHIRE FOG ("SHELLED"); READING FROM THE RIGHT END, OUTER FLOWERING-GLUME, PALEA, AND KERNEL, THE REMAINDER BEING THE ORDINARY SEED OF COMMEECE. ENLARGED 6 DIAMETERS.

YORKSHIRE FOG.

(1.) *With Empty Glumes attached.*—The two empty glumes of Yorkshire fog are unequal in size. The smaller one is a little shorter and overlaps the margin of the larger. Both are slightly tubercled, and more or less covered with short whitish hairs; both are boat-shaped and strongly keeled. The larger glume is 3-nerved, the smaller one 1-nerved. The larger glume frequently has a very short terminal awn.

SPIKELET OF YORKSHIRE FOG, SHOWING UNEVEN EMPTY GLUMES, AND MATURE AND IMMATURE SEED. ENLARGED 6 DIAMETERS.

SPIKELET OF MEADOW-FOXTAIL, SHOWING EQUAL EMPTY GLUMES, FLOWERING-GLUME, AND KERNEL. ENLARGED 6 DIAMETERS.

(2.) "*Shelled.*"—Yorkshire fog, when shelled, varies in colour from a dirty white to a pale lilac, is smooth and fairly shiny. The two flowering-glumes adhere very closely to the kernel, and are hardly discernible. A rudimentary rachilla is often noticeable. Each spikelet of Yorkshire fog contains two flowers covered by the same empty glume. The top one, however, bears male organs only, and hence cannot develop into a mature seed. This fact accounts for there being in each spikelet of Yorkshire fog two seeds, one of which, the upper, is immature. The outer flowering-glume of the immature seed is awned, which awn is hooked and protrudes beyond the end of the empty glumes. Neither of the flowering-glumes of the mature seed is awned.

MEADOW-FOXTAIL.

The two empty glumes of meadow-foxtail are equal in size. They are boat-shaped and strongly keeled. The keel of each glume is fringed with fairly long, slender, whitish hairs; each glume is 3-nerved. Shelled meadow-foxtail is seldom met with, and when found is entirely devoid of any covering. Meadow-foxtail seed has only one flowering-glume, the palea being entirely absent. The flowering-glume is almost as long as the empty glumes, and bears a bent fairly stiff dorsal awn from one-half to twice as long as the empty glume.

The following table, compiled from analyses made in the laboratory, shows the relative frequency of occurrence of sweet vernal and Yorkshire fog in the main agricultural seeds:—

Agricultural Seed in which found.	Of 100 Samples examined—	
	Sweet Vernal was present in	Yorkshire Fog was present in
Perennial rye-grass	9	41
Italian rye-grass	8	51
Cocksfoot	5	98
Crested dogstail	34	76
Chewings's fescue	42	80
Timothy	4	50
Meadow-foxtail	8	22
Poa pratensis	..	4
White clover	6	18
Alsike	..	10
Red clover	..	4
Cow-grass	..	2
Lucerne	..	2
Lotus	24	40

Also in the following seeds:—

Sweet Vernal was noted in	Yorkshire Fog was noted in
Poa nemoralis.	Sheep's fescue.
Suckling-clover.	*Poa nemoralis.*
Ratstail.	Canary-grass.
Canary-grass.	*Poa trivialis.*
Sheep's fescue.	Suckling-clover.
Danthonia semiannularis.	Prairie-grass.
Danthonia pilosa.	*Danthonia pilosa.*
Tall oat-grass.	*Danthonia semiannularis.*
Hard fescue.	Red fescue.
Poa trivialis.	Tall oat-grass.
Red fescue.	Tall fescue.
	Hard fescue.

American Country Schools and Seed-testing Work.—That seeds which have passed school tests sell at higher prices and produce better crops than untested seed is a fact of far-reaching practical importance to all who use seed. Every wise person who either raises or buys seed will insist that the school in his own district take up this work. This idea can be so easily applied in every school, and on every farm its results promise to be of such amazing interest and large benefit that we hope to see it universally adopted.—*American Agriculturist.*

THE GRAZING OF LUCERNE.

FEILDING EXPERIENCE.

Mr. G. de S. Baylis, officer in charge of the co-operative field experimental work in the North Island, has succeeded in persuading a number of farmers in the Feilding district to test lucerne on a practical scale. The results have been very satisfactory, although were these growers to extend their areas of lucerne they would assuredly obtain better results now that they have some practical experience of lucerne-growing and appreciate the special needs of the plant, particularly in the work of establishing it.

Mr. C. M. Ross, of Awahuri, is now feeding his dairy cows on lucerne, which has been established under decidedly adverse conditions. The soil is of fair quality, but is inclined to be sour, while willow-weed and fat-hen rapidly take possession. After ploughing, cultivating, and liming the land the river flooded, and the area was under water for three days. The soil was

then cultivated again, manured, and the seed sown. When the plants were 2 in. high the record flood of the district was experienced, and for eight days the young lucerne was under water. Notwithstanding this harsh treatment a fair stand was obtained. The first time the lucerne was cut it was left to act as a mulch. Two subsequent cuttings were carted out to dairy stock, and the area was then grazed, eighty cows being turned on to an acre and a quarter for half an hour a day for eight days. Two more cuts were obtained during the season. Mr. Ross finds that the cutting of the lucerne is an excellent means of destroying the weeds, while it naturally invigorates the lucerne. Speaking of his experience, he said, "I do not think any farmer who has an experience of lucerne would ever care to do without it. I intend to put as much of my farm as possible into the plant."

Mr. Hector Booth, of Kiwitea, who gives his principal attention to lamb-fattening, is another thorough believer in lucerne as a result of the co-operative field experiment he has conducted. Mr. Booth does not cut any of the lucerne for feeding out in a green state. He either grazes it or converts it into hay. This past season he allowed the sheep the run of the lucerne-field — a six years' stand — as soon as it started to come in October, and the sheep were allowed to feed on it until the end of November, having at the same time the run of other paddocks. He expects by the end of the season to also secure three good cuts for hay from the same field.

In establishing the lucerne the land was fairly clean, but during the winter months it became very foul with couch; indeed, it looked so unsatisfactory that it was thought the attempt to grow lucerne would have to be abandoned. However, the field was well disked and then limed, no lime having been applied prior to seeding. After that the lucerne came away very well, and is now a good stand. Last year a dressing of $3\frac{1}{2}$ cwt. of basic slag to the acre was applied. As Mr. Booth has taken first prizes at the Palmerston North Winter Show for his lucerne hay a brief outline of his method of making it will no doubt be appreciated. He selects a good day to commence operations. The lucerne is cut in the morning and left on the ground till the morning of the following day, when it is made into small cocks and left for a week, and then carted home. Mr. Booth attaches great importance to the size of the cocks. This is not more than can be easily taken up by the fork at the one operation. This system implies, of course, a spell of good weather. However, Mr. Booth has been fortunate in this respect.

Another sheep-farmer in the Feilding district who is quite satisfied with lucerne as a result of a co-operative experiment is Mr. James Knight. The plant has been established on Mr. Knight's property for five years. After the first season's sowing the lucerne was grazed every year, sometimes by cattle but principally by sheep. Mr. Knight, who is a noted figure in the Southdown world, grazes his show sheep and his best lambs on the lucerne, never allowing it to be eaten right down, but the sheep are kept on it practically continuously, especially in the winter. The field gets rather dirty with couch, but it is believed that by cultivating well in the early spring this trouble will be overcome. The first cut of last year was nearly all grass, but the two subsequent cuts were clean lucerne. Two stacks of hay, representing about 16 tons of material, were obtained from the 8 acres, a ton and a half being secured at each cutting. Anything, Mr. Knight declares, does immensely well on it. Lucerne hay is cut into chaff for the young rams, and if lucerne is placed in the racks the sheep take the lucerne in preference to the grass, and they do splendidly on it. Bullocks will not waste a particle of lucerne hay, but the hay requires to be well made. It is cut when well out in flower, and is teddered several times. The hay was out a week, and the leafage held fairly well. Mr. Knight's five-year-old field has had nothing in the way of cultivation from the time it was sown. He considers 10 lb. of seed to the acre for his class of land to be sufficient. Mr. Knight, who investigated lucerne-growing in the Argentine, says that in that country cattle will weigh a good hundredweight more on lucerne than on grass. Mr. Knight is now an enthusiastic advocate of lucerne for the sheep-farmer.

SHEEP GRAZING ON LUCERNE AT WERAROA EXPERIMENTAL FARM.

THE MANGEL CROP AT RUAKURA.

Two months previous to the date on which the accompanying photograph of the mangel crop at the Ruakura Farm of Instruction was taken — 22nd March, 1915 — the crop promised to be an absolute failure owing to the continued dry spell. There was not sufficient moisture to germinate the seed; but immediately after the first light rain was experienced the plants came rapidly away, the growth being phenomenal. The crop now gives every promise of being almost a record one. The only reason that can be assigned for this unexpected development is that the land, since its reclamation from burnt-out swamp, has been deeply ploughed, thoroughly cultivated season after season, while the humus has been restored by green-manuring. As showing the possibilities of such soil, it might be well to state that the no-manure plot in the mangel-field is at present nearly as good as the plots which have been artificially manured. This has never happened before in the history of the farm.

AGRICULTURAL SHOW DATES.

Southland Metropolitan A. and P. Association. — Invercargill, 18th, 19th, 20th, and 21st May, 1915.

Otago A. and P. Association.—Dunedin, 1st, 2nd, 3rd, and 4th June.

Waikato Winter Show Association.—Hamilton, 1st to 5th June, 1915.

Manawatu and West Coast A. and P. Association. — Palmerston North, 22nd, 23rd, 24th, and 25th June, 1915.

South Taranaki Winter Show.—Hawera, 30th June, 1st, 2nd, and 3rd July.

BLÉ NONETTE DE LOUVANNE AT RUAKURA FARM OF INSTRUCTION.

NEW WHEATS.

RESULTS OF RUAKURA TESTS.

A. W. GREEN.

THE testing of cereals is one of the principal phases of the plant-selection work at the Ruakura Farm of Instruction. Each year the varieties being tested are increasing in number, though a few are eliminated every season—those found altogether unsuitable for the environment, or those proving similar to other varieties which are of distinctly more economic value. During the past year twenty-one varieties of wheat were under observation. Of these, nine were tried for the first time, being imported principally from the celebrated French firm, Vilmorin, Andrieux, and Co. Most of these are bearded wheats, and, on account of their hardy constitution, have given, in the exceptionally dry season, high returns. The variety Nonette de Louvanne easily ranked first as a drought-resisting wheat. Unfortunately, this is not a pure strain, and propagation through single-head selections will have to be resorted to before distribution of seed from Ruakura can be attempted. The accompanying photographs give some idea of the growth made by several of these newly imported wheats. It will be seen that the flag is carried high, becomes well developed, and matures fully before ripening. This is made possible owing to the fact that these wheats possess rust-resisting properties to a very high degree. A few of the photographs show the distinctive characters of the heads when viewed closely. The branching form of the variety Blé de Miracle ou de Smyrne is not considered advantageous.

The following are the field-book descriptions of six of the best wheats lately introduced :—

VARIETY: BLÉ PETANIELLE NOIR DE NICE.

From whom obtained: Vilmorin, Andrieux, and Co., Paris.

Purity: A pure strain.

Date sown, 5/8/14; date heading, 3/12/14; date reaped, 21/1/15; date harvested, 28/1/15.

Germination fair; stand light.

Height, 3 ft. 8 in. on 16/1/15; stem thick, strong, stiff, upright until ripening-period, when it bends, forming a swan-neck; tillers fair; leaf medium size, light green, healthy; head bearded, black in colour, resembling heads of caudel wheat, glumes downy, awns long and black.

Liability to lodging: None.

Resistance to rust: A few traces on leaves only, none on the stems; rust-resisting on 4th January, 1915. Resistance to smut: No traces, quite free.

Special Remarks: Strong growth, not affected by drought. Much after the habit of growth as Rivett's wheat. Sheaves weigh light. Estimated yield, 38½ bushels per acre.

BLÉ PETANIELLE NOIR DE NICE AT RUAKURA.

BLÉ PETANIELLE NOIR DE NICE HEADS.

VARIETY: BLÉ DE MIRACLE OU DE SMYRNE.

From whom obtained: Vilmorin, Andrieux, and Co., Paris.

Purity: An aggregate.

Date sown, 5/8/14; date heading, 12/12/14; date reaped, 21/1/15; date harvested, 28/1/15.

Germination good; stand good.

Height, 3 ft. 3 in. to 3 ft. 6 in. on 4/1/15; stem medium thickness, stiff, tillering fair; leaf heavy, broad, much purple coloration on both blade and sheath; head bearded, very variable in size, heads inclined to be short and branched, normal heads have long awns.

Liability to lodging: None.

Resistance to rust: Few traces found on leaves, none on stems; rust-resisting. Resistance to smut: Few traces.

Special Remarks: Heavy crop. Many branching heads present, and in these heads the grain is smaller, but more grains produced per head. Not considered advantageous. Estimated yield, 43 bushels per acre.

VARIETY: BLÉ DE PITHIVIERS.

From whom obtained: Vilmorin, Andrieux, and Co., Paris.

Purity: Pure strain.

Date sown, 5/8/14; date heading, 4/12/14; date reaped, 21/1/15; date harvested, 28/1/15.

Germination good; stand good.

Height, 3 ft. 9 in. to 4 ft., 4/12/14; stem medium thickness, upright, tillering freely; leaf heavy, dark green, glaucous green when young; head beardless, red, vary in size, mostly large and well filled.

Liability to lodging: None.

Resistance to rust: Slight traces on both leaves and stems on 2nd January, 1915. Resistance to smut: Traces.

Special Remarks: A fine variety; should yield heavily in a normal season. Affected by drought to some extent. Well worth continuing. Estimated yield, 47 bushels per acre.

VARIETY: MARQUIS.

From whom obtained: William L. Ramsay, Bradworth, Saskatchewan, Canada.

Purity: Pure.

Date sown, 5/8/14; date heading, 25/11/14; date reaped, 13/1/15; date harvested, 21/1/15.

Germination excellent; stand excellent.

Height, 3 ft. 7 in., 6/1/15; stem strong, medium thickness, erect, tillering freely; leaf medium size, dark green, healthy and robust; head long, well filled, beardless, carried erect.

Liability to lodging: None.

Resistance to rust: A very few traces found on 2nd January, 1915. Resistance to smut: Free.

Special Remarks: One of the best crops of milling-wheat under trial. Its rust-resisting properties were most marked when compared with the well-known varieties White Straw Tuscan and Bobs. Estimated yield, 48½ bushels per acre.

VARIETY: WILD GOOSE SPRING.

From whom obtained: Guelph.

Purity: Pure.

Date sown, 5/8/14; date heading, 6/12/14; date reaped, 21/1/15; date harvested, 28/1/15.

Germination excellent; stand excellent.

Height, 3 ft. 6 in. to 4 ft., 10/12/14; stem long, strong, wiry and hard, tillering freely, bright clean straw when harvested; leaf medium to heavy,

glaucous green when young, bright green when older; head bearded, awns long, often become twisted when shooting, heads large.

Liability to lodging: None.

Resistance to rust: Free. Resistance to smut: Free.

Special Remarks: A Durum wheat, hardy and free from diseases. Not much affected by drought. Estimated yield, 46 bushels per acre.

VARIETY: NONETTE DE LOUVANNE.

From whom obtained: Vilmorin, Andrieux, and Co., Paris.

Purity: An aggregate.

Date sown, 5/8/14; date heading, 30/11/14; date reaped, 23/1/15; date harvested, 27/1/15.

Germination excellent; stand excellent.

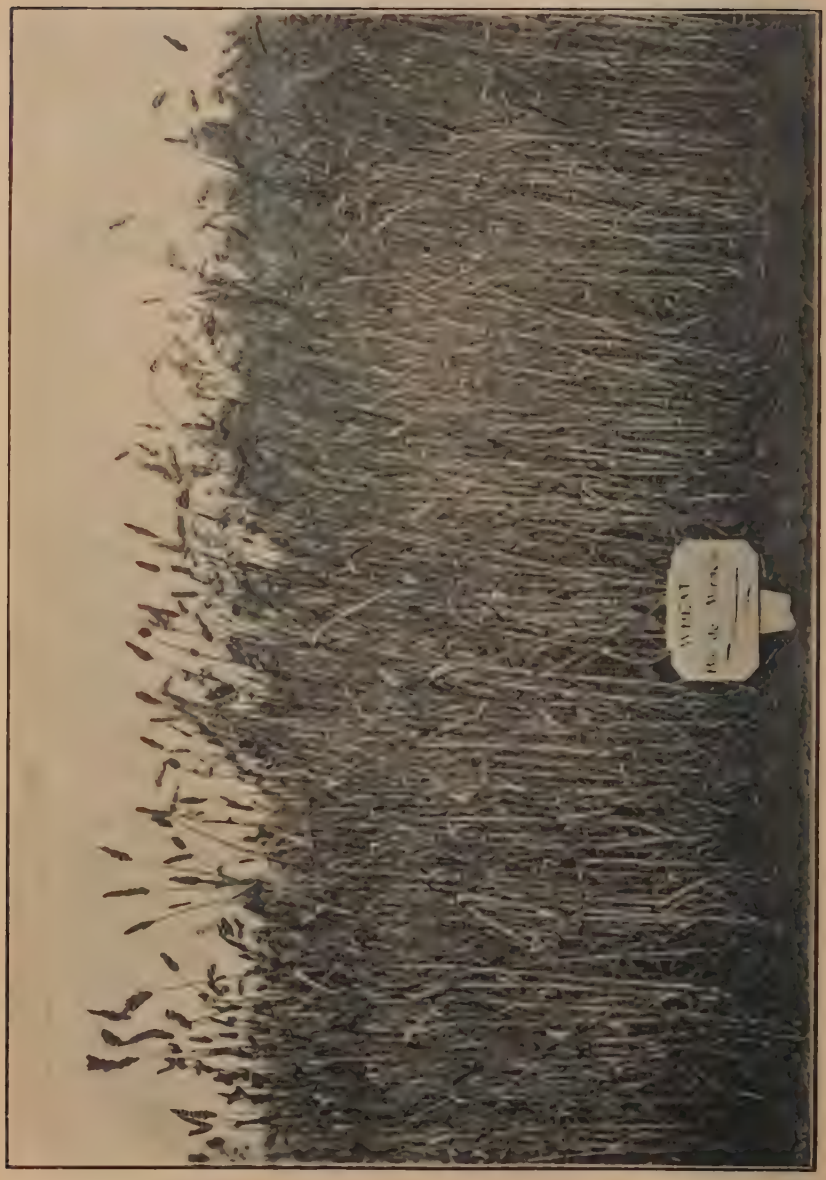
Height, 4 ft. 6 in. to 4 ft. 8 in. on 2/1/15; stem heavy, strong and hard, glaucous green when young, bright golden when ripe, tillers well; leaf medium size, healthy green; head bearded, glumes downy and purple in colour, awns long.

Liability to lodging: None.

Resistance to rust: Very few traces on leaves, highly rust-resisting. Resistance to smut: Free.

Special Remarks: The highest wheat in the field of experiments. Made rapid growth from December to January. Not affected by drought. Estimated yield, 51 bushels per acre.

MARQUIS WHEAT, GROWN AT RUAKURA.



BLÉ DE MIRACLE OU DE SMYRNE AT RUAKURA.

BLÉ DE MIRACLE ON DE SMYRNE, SHOWING BRANCHING OF HEADS.

BLÉ DE PITHIVIERS, GROWN AT RUAKURA.

WILD GOOSE SPRING WHEAT, GROWN AT RUAKURA.

PASPALUM DILATATUM.

R. J. HAMILTON, Karangahake.

SOME years ago my attention was drawn to paspalum. I determined to give it a trial in this country under some ordinary and some extraordinary conditions. In each case I sowed some rye with it as a check.

The grass was sown under the following conditions:—

(1.) In a low-lying swamp, which was flooded for some time and could be kept flooded for six months.

(2.) In a swamp, which flooded for a month at a time, but never for longer than six weeks.

(3.) In among rank toetoe, which was at the time strong and vigorous.

(4.) On a burn on a dry hillside in the beginning of January.

(5.) In among pennyroyal 1 ft. high.

(6.) On rushy and swampy ground, which was always soft.

(7.) In a well-tilled, well-manured piece of river-flat.

(8.) On a well-cultivated but dry hilltop.

(1.) This was sown in dry weather, and came up and grew quickly. It was 4 in. high in five weeks. It was eaten down and continued to do well till winter. Then the water came over it. It still looked well after three weeks. I then closed the outlet and left it under water for six months, at the end of which time it was dead. It has not shown up since.

(2.) This germinated well and made a good growth. It has been under water for a month at a time, but is still strong and vigorous. It is relished by cattle, and throws a large quantity of seed. The rye died that first season.

(3.) In this case I could not find any sign of the paspalum for nearly two years; then it began to show up. I cannot say it has killed the toetoe, but it has made considerable progress against it, and seems to be more than holding its own. The rye did not appear at all. Some cocksfoot also failed to make a showing.

(4.) This seed lay dormant and apparently dead till early autumn; then it began to shoot, and before winter the whole face of the hill was covered with a thick growth. The grass is still there and throws a good amount of feed.

(5.) When the pennyroyal died down the paspalum-plants were to be seen in hundreds, and before next summer the ground was covered with such a mat that the pennyroyal died away altogether.

(6.) The paspalum germinated and continues to grow. The bigger bunches of rushes seem to hold it in check, but is spread over the intervening spaces, giving a good supply of herbage under conditions which few grasses would stand. The ground is wet and spongy, and must be very sour, for it is never dry. Yet the paspalum grows and spreads, a sure indication of its great vitality.

(7.) Here the paspalum did splendidly. It throws an enormous amount of feed in late spring, summer, and autumn. It has long since killed out all other grasses and has formed one compact mat, which would be very difficult to plough or to bring into cultivation.

(8.) Here the grass germinated fairly well and grew slowly. It did not at first throw as much feed as rye or cocksfoot, but after the third year it did better than these grasses. It did not, however, grow nearly as well as that on the rich alluvial flat or as that on the damp swamp land, but it did fairly well and has outlasted all the other grasses except danthonia, brown-top, cocksfoot, and white clover.

The results of my experiments may be summarized as follows: Paspalum grows under a greater variety of conditions than most grasses. It will remain alive under water for weeks and will resist drought for months. It gives more feed than any of the ordinary grasses during summer and early autumn. It does not grow much in autumn or in early spring. It may, however, be shut up in February. It will then grow to a height of 2 ft. or more, and will make excellent winter feed for fattening or dairying. Cows milk as well on paspalum as on rye and much better than on cocksfoot. It does better than most grasses on poor land, and its feeding-value is high. It takes possession of rich river-flats, and should not be sown extensively in good land. It germinates best if sown in January or February. If sown in the late autumn very little of it is ever seen. It is an excellent grass for rough hilly country, and should be sown extensively in bush burns on hilly country that cannot be ploughed. If this is done, however, some of the paddocks should be shut up for winter feed. In North Auckland it grows for about eight months of the year.

THE POTATO.

AN HISTORICAL SKETCH.

J. BEVERLEY.

ONE of the most interesting personalities in the history of the potato is that of Archibald Findlay, the Scottish grower whose name is associated with some of the most sensational varieties of potatoes ever raised, including the well-known Up-to-Date. It was about the year 1897 that Mr. Findlay, on his farm at Mairsland, Auchtermuchty, N.B., made a lucky cross by using Patterson's Victoria and the old Blue Don as parents. He obtained from the cross-pollination of these two varieties one plum or potato apple, and from this one apple no less than five well-known varieties were raised—namely, Northern Star, Eldorado, Evergood, Goodfellow, and Royal Kidney. It is Northern Star that chiefly interests us at the present time. The first year it was sent out several sports were selected by growers, and some of these have come on the market. Our New Zealand potato Gamekeeper is supposed to be a sport out of Northern Star. It is not correct to say Gamekeeper is Northern Star—there is a botanical difference in the flower of these two varieties. Out of Gamekeeper we have secured another sport in Maori Chief. The colour of this shows a reversion to the original parent, Blue Don. Maori Chief has sported a purple which is said to be very good, and this season at the Moumahaki Experimental Farm out of Maori Chief a white sport has been obtained, much like Findlay's potato Great Scot: this may yet prove a white Maori Chief. Mr. Findlay refused to disclose to any man the pedigree of Up-to-Date, except that Patterson's Victoria was one of its parents. It is supposed that Up-to-Date was a natural seedling from Patterson's Victoria, like Niven's Table-talk. Mr. Findlay lost his stock of Patterson's Victoria, rats getting into his precious little store of the tuber and eating up the whole of it while he was away at the Smithfield Show. So far as was known at that time this great parent potato was then supposed to be extinct in England.

In the year 1905 I searched the Channel Islands, where it was known to have been grown, for the lost variety, and at last found it in the garden of a French grower, who informed me that he and his father had grown it for forty-two years without change of seed. It is ten years since I obtained this old parent potato raised by

William Patterson, of Dundee, in the year 1860. At the time it was raised Queen Victoria created quite a sensation by ordering tubers of it for the Royal gardens by letter in her own handwriting. This Royal patronage gave unusual prominence to the work of the great pioneer in potato-improvement. William Patterson was the first man to hybridize and cross-fertilize the potato, commencing this work in 1826. By reason of his investigation at that time it has been said that he alone saved the potato from extinction.

PECULIAR DEVELOPMENT OF POTATO.

THE accompanying illustration shows a very peculiar form of tuber-development that has not been uncommon in certain crops that were exposed during the past season to very dry conditions during the early period of growth. Instead of developing normal aerial haulms the eyes developed into tubers directly, and no organs whatever were formed above ground. A similar development is sometimes produced

in potatoes stored in a dry, *warm* pit or store. It is evident that the comparatively dry, warm conditions to which the sets were subjected caused the food-materials stored in them to travel to the growing-points, but the conditions were not sufficiently favourable for the development of haulms. When once the reserve food of the sets becomes located in the eyes those organs instead of remaining rudimentary aerial stems become metamorphosed into tubers.

LUCERNE AT TAURANGA.

EXPERIENCE AT THE EXPERIMENTAL FARM.

W. BERRIDGE.

THERE is at the present time a thriving field of lucerne at the Tauranga Experimental Farm. The work of establishing it was not easy. The land was very weedy. Before the Department purchased the property the land had been continuously cropped for over thirty years. At the first attempt the lucerne failed, no lime being employed. Then the land was ploughed and scarified to kill the twitch and sorrel, and left fallow all the summer. In the autumn it was sown to Cape barley. In September this green crop was ploughed under. Lime was then applied in varying proportions on the furrow. One portion received at the rate of a ton of lime to the acre, another portion at the rate of 12 cwt., and another at the rate of 7 cwt., while a fourth part was left untreated. The same manure—4 cwt. of bonedust and 2 cwt. of superphosphate—was applied over the whole area. The seed was sown at the rate of 20 lb. to the acre (this heavy seeding being necessary by reason of the depredation of birds in the neighbourhood), and an excellent strike was obtained. The difference between the various limed portions and that unlimed was immediate and most striking. Notwithstanding the very careful preparation the lucerne on the unlimed soil absolutely failed. On the portion which received the ton-per-acre dressing of lime the growth was excellent, being distinctly the best of the whole area; the growth on the other two limed portions being much less vigorous, the portion with the smallest dressing of lime having the poorest development of the lucerne-plant.

In the late winter, when the growth of lucerne ceased and fog and cocksfoot were growing strongly, the land was disked eight or nine times, with the man riding on the disks. It was then peg-harrowed three times. Chain harrows were afterwards employed to gather the weeds, which were carted off. This treatment proved thoroughly effective in killing the weeds, and a clean vigorous lucerne stand was secured. Lime was subsequently applied as a top-dressing to those portions of the field which had received the lighter initial dressings, in order to obtain an even stand. In disking

in the late winter a well-established lucerne-field having much foreign growth there need be little fear of overdoing it. Disk until it looks as if the lucerne is quite killed out, and then give it another disking to make sure. This may appear to be rather drastic treatment, but it is treatment the lucerne-plant appears to enjoy.

ASHES OF HEDGE-TRIMMINGS A SOURCE OF POTASH.

THE ash of bonfires composed of threshing-waste, grass, weeds, dead and green wood, &c., was found to contain 11 per cent. of potash (K_2O), a percentage nearly equal to that of kainit, which contains about 12·5 per cent. of potash. Thus some of the normal processes of farm routine give rise to ash rich in potash, which would in normal times be worth £2 per ton, and is now worth much more. Since the potassium is present in the ash as carbonate, and therefore soluble in water, care must be taken to prevent loss due to rain, as experiments showed that a single night's rain of less than 0·1 in. diminished the potash in a heap of ash by 50 per cent. The cleaning-out of hedge-bottoms yielded about 5 lb., and hedge-trimmings on the average 15 lb. of ash per 100 yards of hedge (one side only). A 20-acre field with 1,300 yards of hedge would, therefore, on this basis yield ash equivalent to more than ½ cwt. of kainit from the hedge-bottoms, and to nearly 2 cwt. from the total trimmings. It was found that the cost of labour for obtaining and burning such clippings worked out at from 3d. to 8d. per pound of ash when the material was mainly grass, and about 2d. per pound when more wood than grass is present. Even when the ash could be obtained for 1d. per pound this is equivalent to kainit at £9 10s. per ton; so that potash obtained in this form would be very expensive if charged with the whole cost of the process, but where the trimming, &c, has to be done in any case, it would well repay the trouble of collection.—*Journal of the Board of Agriculture, Great Britain.*

Another World-record Cow.—An American Guernsey, Murne Cowan, is said to have established a new world's record. In the twelve months ending on 19th February of this year she gave 24,008 lb. of milk, containing 1,098·18 lb. of butter-fat. The total cost of feed was 53·9 cents a day.

DAIRY BULLS.

LESSONS FROM THE REGISTER OF MERIT.

W. M. SINGLETON.

As a continuation of the comment in last month's *Journal* under the above heading, I wish to refer to a number of bulls which are also in the C.O.R. class by virtue of having a minimum of four certificated daughters from as many different dams.

HOLSTEINS.

Next in order of merit on our list is the well-known Holstein-Friesian sire—

Cliffside Laddie, bred by Mr. W. I. Lovelock, of Palmerston North, and now owned by Mr. A. H. Street, Bell Block. The

CLIFFSIDE LADDIE.

highest-record daughter of this bull is Duchess of Delhurst, which, starting at the age of 3 years 329 days, produced 615·85 lb. of butter-fat. This is the fourth-best record yet made in the three-year-old Holstein-Friesian class. Pietertje Lassie of Cliffside,

commencing her test at 2 years 297 days, has done her breeding great credit with a record of 597·28 lb. of fat. With this record she is second only to Netherland Princess IV in her class. The third daughter of this bull, and tested by Mr. Lovelock, is Nancy Lee of Cliffside. Commencing her test at 2 years 124 days, she produced the fine record of 498·88 lb. of butter-fat. This is splendid work for a year's test in heifer form. Other "Certificate of Record" daughters of this bull are Holland Lassie, which, commencing at 1 year 333 days, produced 424·47 lb. of fat; Holland Queen II, with a certificate for 413·18 lb. of fat, starting her test at 2 years 141 days; and Laddie's Pearl, which

GRACE'S NETHERLAND OF RIVERSIDE.

commenced a test at 2 years 321 days, and in 348 days produced 348·33 lb. of butter-fat.

Mr. Lovelock is not only the breeder of Cliffside Laddie, but of these six daughters of the bull as well, and has great reason to be proud of his achievement. Other daughters of this bull will yet be heard from.

Grace's Netherland of Riverside. — This is a bull of North American breeding, and he is proving a great asset to New Zealand dairying. Grace's Netherland of Riverside was imported in 1905 by Mr. Charles Hopping, and he was used in the owner's herd at Glen Oroua until its death two years since.

Judging by the records of his progeny, it is most unfortunate that this bull was not in use more than some six or seven years, although this is much above the average length of service rendered by even purebred dairy bulls. This bull has now to his credit four C.O.R. daughters, and we have in test four others at Mr. C. A. Hopping's, all of which have produced beyond their required amount of butter-fat, and are still going strong. Providing their calving subsequent to test is in order, these will attract considerable attention at a later date.

Of the daughters of this bull already qualified, none have milked longer than 304 days in test, Mr. C. A. Hopping having adhered to a ten-months milking-period. The best record is that of Leila Mooie of Ashlynn, which commenced her test at the age of 5 years 321 days, and has a certificate for 529·31 lb. of fat. Countess of Maplehurst, in the four-year-old class, has to her credit 502·09 lb. of fat for the 304 days. The next best record daughter, considering age, is Princess of Ashlynn, which in the three-year-old class produced in 304 days 413·66 lb. of fat, while a five-year-old daughter, Lucy Witt of Ashlynn, produced 462·93 lb. of fat in the 304 days.

While these records are good, other daughters of this bull are likely to produce records which will transcend these. It would appear that a bull's actual worth is best represented through the production of his daughters, and on this basis Grace's Netherland of Riverside must be held in very high esteem.

JERSEYS.

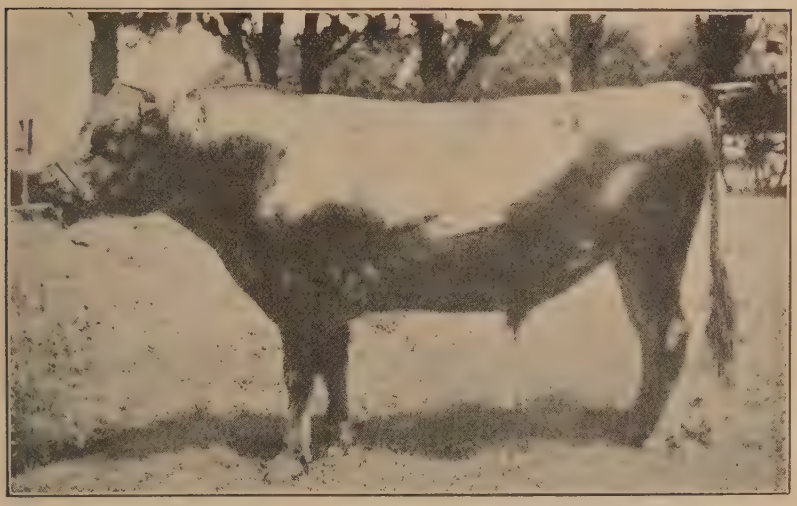
Pride of Egmont was born in 1898. He was bred by Mr. C. Day at Tamahere, who is one of New Zealand's pioneer breeders and importers of Jerseys. Pride of Egmont is a grandson of Beauty II, a foundation cow owned by Mr. Day. Many good Jerseys in New Zealand trace their line of descent to this cow, and she evidently had that prepotency which enabled her to transmit to an exceptional degree her superior Jersey qualities. Mr. J. G. Harkness, now Secretary of the National Dairy Association, purchased this bull at Mr. Montgomery's clearing-sale, and for some time used him as the head of his herd at Tariki. On Mr. J. G. Harkness removing to Wellington, possession of his herd, which included Pride of Egmont, passed into the hands of his son, Mr. W. V. Harkness, of Tariki. Mr. W. V. Harkness has had five of this bull's daughters on test, and, when the comparatively short milking-period is considered, these records evidence the presence of good dairy blood.

The record of Zephyr as a mature cow is good, and shows the splendid credit of 417·94 lb. of fat in only 257 days. Had she been milking 365 days, as many of the cows on test have done, the figures would probably have attracted more attention. Zillah, with 415·86 lb. of fat in 295 days, is also a credit to her sire. Fuchsia, in the four-year-old class, has a record of 402·15 lb. of fat in 311 days. May Day and Bustle's Pride also figure in the list of C.O.R. daughters sired by Pride of Egmont.

Campanile's Sultan is a younger bull than either K.C.B. or Blizzard, referred to in the last issue of the *Journal*, and, other things being equal, would not be expected to have as many C.O.R. daughters. He was born on Jersey Island in 1906, was imported by Messrs. Griffiths and Cornwall in 1907, and was purchased by Mr. Charles Clarke in 1908. Campanile's Sultan is sired by Sultan of Oaklands. Sultan of Oaklands is also the sire of Rozel's Sultan, a Jersey bull imported by Mr. J. G. Harkness in 1911.

The highest-record daughter of Campanile's Sultan is Campanile's Lady, owned by Messrs. Clague Bros., of Manaia. This cow, starting at 2 years 314 days, produced the splendid record of 356·42 lb. of fat, which was some 85 lb. of fat above her requirement. Campanile's Rose Queen, owned by Mr. R. J. Linn, of Normanby, has a record but little behind that of Campanile's Lady. She produced 352·76 lb. of fat in 304 days, and was 4 years 357 days old at the commencement of her test. Rose-tree, another daughter of this bull, and owned by Mr. R. F. Wilkinson, Pukekohe, in 318 days produced 317·62 lb. of fat. Duchess of Ferngrove, which is credited with 267·03 lb. of fat in 300 days, and Campanile's Palm, with 292·48 lb. of fat in 269 days, are other daughters that have won certificates. These latter two were in heifer form, and neither was more than 2 years and 1 month old.

Majesty's Fox, owned by Mr. S. R. Lancaster, near Palmerston North, was imported from the Island of Jersey in 1908. He was born in 1907, and since arriving in New Zealand has been the property of Mr. Lancaster. He is as yet not an old bull, but Mr. Lancaster has bred four C.O.R. daughters from him, two of which Mr. Lancaster has had tested. One is owned and tested by Mr. A. M. Wighton, of Palmerston North, and one by Mr. A. Moreland, Papatoetoe. These daughters are all young, but the oldest, Bright Star II, has placed on record the very fine production of 542·86 lb. of fat in 328 days. This is some 230 lb. of fat over her requirement for certificate, she



PRIDE OF EGMONT.

CAMPANILE'S SULTAN.

being only 3 years 356 days of age at the commencement of her test.

The next best record was made by Little Champ. Starting at 3 years 34 days, she gave 366·75 lb. of fat in 293 days. This is 86 lb. more than her standard, and is a good record for under ten months' milking. During this 293 days she produced 8,754·2 lb. of milk, a splendid production for a cow of this age.

Another daughter, Majesty's Eileen, after her first freshening, produced a record of 351·82 lb. of fat in 324 days. She was 2 years 71 days old at the commencement of the test, and her yield is 104 lb. of fat over her required standard. This daughter

MAJESTY'S FOX.

also has done good work. More especially is this the case when it is considered that her milking-period fell 41 days short of a year. She dropped her subsequent calf in 1 year 1 week after starting her test.

The fourth daughter to qualify for certificate is Spotted Fox. This heifer commenced at the age of only 1 year 225 days, and had the misfortune to give birth to a calf prematurely, which closed her milking-period at 274 days. During this time she had, however, produced over her requirement of butter-fat for certificate, and under the special circumstances made the creditable record of 246·51 lb. of fat.

CATECHISM OF PRACTICAL AGRICULTURE.

CONTINUED.

PRIMROSE McCONNELL.

79. *In breaking up an old pasture for a cereal crop what type of plough would you use?*

If the land were fairly even, and not growing long rushes or fern, I would use the ordinary single or double furrow.

80. *Would you plough deep, or skim-plough, in the first place?*

Time permitting, I would skim-plough, then roll, disk, harrow well, and then plough again to the required depth.

81. *If the field were required for immediate seed-sowing, how would you proceed?*

I would plough to the required depth at once, making a well-set-up, closely packed furrow, then roll, disk, and tine-harrow, and immediately sow the seed.

82. *If the pasture were very uneven, and growing rushes, &c., which plough would you use?*

Preferably the swamp-plough, which should have a plough-chain attached to the beam to drag under all surface growth.

83. *Which plough would you preferably use for ploughing a pasture with even surface for a root or other fallow crop?*

I would use a digger-plough with a skimmer attachment, ploughing at once to the desired depth, or the swamp-plough, which should turn over a wide, thin furrow; then roll, disk, and replough as for cereals.

84. *Given your choice, would you plough earliest for a fallow or for a cereal crop?*

For a fallow crop.

85. *What is the object of ploughing early and deep?*

Land ploughed early (in autumn or early winter) has a longer exposure to the beneficial influences of the air, sun, and frost, and also stores up abundant moisture from winter rains, which minimizes the effects of a summer drought.

86. *Why is a store of moisture not so necessary for a cereal crop?*

Because the cereal crop, if sown at the proper season, has a moisture-protecting covering of foliage before drought-conditions are usually experienced, while its period of growth is often ended before the drought commences.

87. *Through a rotation of cropping is it good policy to plough at one depth, and give reason for reply?*

No. If land is always ploughed at one depth a hard-pan is formed by the plough, which prevents the free growth of roots and the ready admission of air and water.

88. *What means would you adopt in breaking up this pan?*

The best course is to use the subsoil-plough.

89. *Describe the action of the subsoil-plough.*

The subsoil-plough consists of a strong, complete, single-furrow plough with a very strong tine attached to the after-part. The plough in front turns over a furrow at an ordinary depth, and the strong tine behind breaks up the pan at the bottom of the furrow to at least an equal depth, but does not bring the broken-up subsoil to the surface.

90. *Why is it not good policy to plough land having a hard-pan to a good depth and turn it right up to the surface?*

Because the pan, not being exposed to the action of the atmosphere, is as a rule of a very acid nature, and if a considerable quantity were turned up to the surface at once, plant-growth would be deleteriously affected for some time.

91. *If a complete subsoil-plough is not available, what implement would you use?*

Failing a subsoil-plough I would plough with an ordinary single-furrow in front and follow with another similar plough stripped of all its parts with the exception of a strong, sharp, and comparatively narrow share, commonly called a skeleton plough.

92. *In preparing for the cereal crop, when may the roller be used to advantage?*

As previously stated, it may be used for rolling the plough-furrow, also just before the seed-drill.

93. *What is the object of rolling before the seed-drill?*

To provide a firm seed-bed, and to ensure an even and not too deep covering of the seed.

94. *Would you roll after the seed-drill?*

Only in exceptional cases, such as light, sandy, or peaty soils.

95. *Why is it often detrimental to roll after the drill?*

Because a loose surface soil acts as a soil-mulch, and to some extent prevents bad results from drought; but when rolled the soil-mulch is destroyed and the moisture evaporates quickly.

96. *At what depth should cereal-seeds be sown?*

Two to three inches.

97. *When may rolling after the drill on medium or clay soils be carried out without ill effect?*

When the soil is exceptionally dry and the surface-tilth coarse.

98. *Should the roller be used when the land is wet?*

No. When the land is under cultivation the roller should never be used if the land is wet.

99. *If the land is dry immediately underneath, but wet on the surface, may the roller be used?*

No.

100. *What would be your guide under such circumstances?*

Whenever the soil adheres to the roller the rolling should cease.

101. *Should the cereal crop receive any cultivation between sowing and reaping?*

Yes; it is very beneficial to harrow the land when the plants are about 6 in. in height.

102. *How does cultivation at this stage benefit the crop?*

It benefits the crop by lightening up the surface soil-mulch, admitting air, and destroying weeds.

103. *What precautions should be taken in harrowing at this stage?*

That the operation is not carried out during wet weather, and that the harrows are not too heavy.

WORK FOR THE COMING MONTH.

NEW ZEALAND is a country of wide variation in climatic and soil conditions. In applying suggested procedure it is, therefore, necessary for the farmer to amend it to suit local weather-conditions and the requirements of his soil—information which can best be ascertained by a study of these problems on the part of the farmer himself. Nothing can take the place of local knowledge. Little advice on an agricultural subject is capable of general application in its entirety.

THE FARM.

PRIMROSE McCONNELL.

In the North Island much oat-sowing and in the South Island much wheat-sowing is done in May. As for all other crops, the preparatory cultivation should be good, yet, if the tilth is deep, it is not an advantage to have the surface soil so very fine, because a "knotty surface" to some extent prevents cracking by the heavy rains of winter. Provided the soil is not too wet, it is good policy to roll in front of the seed-drill, as this ensures the seed being sown at a comparatively even depth and makes a firm seed-bed. When sowing at this time of the year it is wise not to roll after the drill, and at no other time except in the case of light, sandy, or peaty soils. The seeding should be fairly liberal — oats 3 bushels and wheat 2 bushels per acre—and the quality the best procurable. The question of variety has to be decided by local conditions. The two oat varieties most suitable for the North Island are undoubtedly Green's Ruakura and Algerians, and when grown at Ruakura side by side the former has given results far in advance of the latter. Even from the South Island some excellent reports on Green's Ruakura have come to hand within the past few days. The success of this variety is often limited by too-late sowing, but at the same time I do not expect it to be so successful in the South as in the North Island.

As advised in last month's notes, all cereal-seed should be treated for the prevention of smut.

The last cut of lucerne should now be made use of, if not already consumed. It is too late to risk haymaking, but it may be made into ensilage, soiled, or grazed. The latter course

was adopted at Ruakura last season with good results, and, although the grazing was done during wet weather and the stock never removed until the growth was consumed, there was no sign of bloating. The absence of bloating I attribute to the fact that the lucerne was fairly mature when the sheep were turned in. An ideal lucerne-paddock should be long and narrow, so as to minimize the cost of temporary fences; and the New Zealand temporary sheep-fence is cumbersome in the extreme.

Light hurdles might be made with long feet, which prevent their being easily upset, and each joined to the other with two movable wooden pins. If the field were narrow, the hurdles could be moved forward a yard or two each day in a very short time, or they might be made so that the sheep could put their heads through and eat a narrow width of the crop without treading on it. A second line of hurdles would be required to prevent the sheep continually falling back on the already-eaten-over ground, and the new growth must be allowed to come away as rapidly as possible without being too closely eaten in the first place. The hurdles must be made of two rails (knotless *Pinus insignis* will do), and the space between may be filled in with good sheep-netting. Failing hurdles, the fence-posts should be sufficiently light to admit of their being easily driven into the ground with a mallet. Posts of an average diameter of 2½ in. are quite strong enough, and a man can easily carry six to eight on his shoulder. A handy iron crow-bar and mallet combined, for making post-holes and driving the posts, should be about 3 ft. in length, with a circular, thick, flat piece of iron in the centre, as illustrated, the round part being used for driving posts, which should be well pointed and the tops bound with wire or iron girthing to prevent splitting. An easy way of fastening the nets to the post is to drive two hooks, one at the top of the post and one close to the surface of the ground, the distance apart being exactly the same as the width of the net. The nets are simply hooked on to the posts, and are quite secure if the hooks are the proper distance apart. The hooks need not be removed—they should be kept permanently in the posts. With this equipment a temporary sheep-fence may be erected in a very short time, and when taking down the fence it is only necessary to unhook the netting and roll it up.

A good length of fencing may be taken down in a few minutes. This fence is equally useful in the turnip crop.

Western Wolths, tares, peas, barley, rye, corn, and oats may still be sown as catch-crops for feeding off, or white mustard may be sown for ploughing under. In last month's notes it was stated that no drill on the market would sow Western Wolths grass effectively. For "Western Wolths" please read "prairie-grass." The Western Wolths is just as easy to sow as rye-grass.

Chain-harrowing of pastures may now be done with advantage, also top-dressing or liming. Where the pastures are very steep, however, the top-dressing with fertilizers is better delayed until spring, as the heavy rains of winter are apt to wash away a considerable portion of the manure.

In some districts the potato-moth has already done a great deal of damage to tubers which are exposed above the surface of the soil, and it is a good plan to gather all the exposed potatoes before the crop is dug and have them boiled for pig-feed. When this disease is present all tubers selected for seed, although showing no signs of the moth, should be steeped in a formalin solution before "boxing" them. The best method is to fill the seed-boxes with potatoes, then immerse potatoes and box in the solution for about five minutes.

Cows will be drying off, and should have a six-weeks complete rest between the lactation-periods.

Where foot-rot is prevalent the advent of wet weather is sure to stimulate the disease, and it should be taken in hand at once, as a sheep badly affected with foot-rot is fed at a loss. When the disease is very bad the lame sheep should be drafted off and have their feet thoroughly examined, all loose horn being carefully removed with a sharp knife or foot-rot shears, and a bluestone ointment applied and well rubbed into the diseased parts. The sound members of small flocks should be driven slowly through a foot-bath at least twice, and afterwards at intervals of a week. For the foot-bath I have found nothing better than a solution of bluestone and Murton's dip. Very severe applications, such as butter of antimony, are not desirable, as they dry up the diseased parts too quickly, and very often the cure is only superficial. Although there is no actual proof that this disease is contagious, it is wise policy to separate the lame sheep from the sound for the time being, as by doing so the trouble of repeated dressing is much lessened.

In connection with the dairy herd, wet days may be well spent in whitewashing cow-sheds, calf-pens, &c. A little crude carbolic acid should be added to the whitewash.

THE ORCHARD.

J. A. CAMPBELL.

PRUNING and spraying, especially of stone-fruit, should be well under way during this month, in order to have as much of the work completed as possible before the bad weather sets in.

The question of whether it is advisable to spray before or after pruning is worthy of consideration just now. Taking the matter from the point of view of spraying alone, there is no doubt that the work can be most thoroughly done before pruning.

Winter spraying, as with all other spraying, to be successful must be thoroughly done. All parts of the tree must be well covered with the mixture, including the tips of the branches, which in many cases are badly sprayed or missed altogether. Pruning after spraying results in the removal of practically all these unsprayed tips. The thorough covering of the whole tree becomes more necessary when dealing with those insect pests which increase rapidly during the summer, such as red mite and the various scale insects, particularly San Jose scale.

San Jose scale cannot under any circumstances be successfully controlled in the summer owing to the extraordinary manner in which it increases, and the inability of the foliage of the tree to withstand a spray sufficiently strong to destroy the perfect insect. Trees sprayed one day will be found to have numerous migrating young scale on them the next. Therefore the danger of leaving any portion of a tree affected with this scale unsprayed can be readily seen.

The summer control of red mite can only at best be considered a partial remedy, its main value being in keeping the disease within bounds until the dormant season.

More particularly does thorough winter spraying apply to such trees as the peach, the under-foliage of which is another factor against efficient summer spraying.

The objection to pruning after spraying is that the wood cannot be as readily distinguished when coated with spray, especially the dead wood. In the case of the peach, pruning is delayed until the tree is sufficiently dormant to allow of oil-spraying, and also because of the extra amount of material required to spray an unpruned tree.

To lessen these objections all dead wood, crowded and cross branches, &c., should be removed before spraying.

SPRAYING.

Woolly Aphis.—Two comparatively weak sprayings of emulsified oil have proved very satisfactory in keeping woolly aphis well under control. Time of application and strength of spray are as follow: Strength, 1 in 25. Apply as soon as the foliage has fallen sufficiently to allow of thorough spraying, and again late in the dormant season just before the buds begin to swell.

Die-back and Ripe-rot. — Spray with the winter formula of Bordeaux mixture or with commercial lime-sulphur at the rate of 1 in 15.

Red Mite and San Jose Scale.—Spray with lime-sulphur 1 in 15, or emulsified oil 1 in 17, the latter in preference. Use the oil-spray only when the tree is quite dormant.

ORCHARD EXTENSION.

As this matter has been written up from time to time in this *Journal*, and in bulletin form by Mr. W. A. Boucher, I do not intend to elaborate, but to confine my remarks to a few hints which may be of value to those intending to plant this season who may not have had the opportunity of reading these articles.

Preparation of the Land. — The preparation of the land for orchard planting must to a great extent be governed by the nature of the soil under consideration. Heavy tenacious soils require thorough and deep working, usually a season or more being necessary to bring them into a fit condition for planting. Deep, well-drained, friable soils can be more readily prepared. A deep autumn ploughing, followed by thorough disking and harrowing, is generally all that is needed. At the same time, summer fallowing in all cases is a decided advantage. Whatever the class of soil the final result prior to planting should, as nearly as possible, be the same—that is, a deeply worked, finely pulverized planting-bed.

Drainage.—This all-important matter should be well considered when laying out a young orchard. Here again heavy soils require the most attention and present the greatest difficulties. Some of these are so dense that it is almost impossible to drain them. In such cases a thorough drainage-system should be planned at the outset and carried out by means of field-pipes, scrub-drains, &c., and the nature of the soil altered as much as possible to make it amenable to drainage by the free application of lime, together with the raising and ploughing-in of cover-crops most suitable for providing humus. Lighter and more porous soils, hillside slopes, &c., present less difficulties; but in regard to the latter

it should not be taken for granted, although the lay of the land suggests ample drainage, that such is the case.

Shelter.—The planting-site, together with the natural shelter existing, to a great extent governs the class and amount of artificial shelter required.

Where possible, shelter-trees should be well established before the fruit-trees are planted, especially if the situation is an exposed and windy one. For such positions, if land is plentiful, shelter-belts of *Pinus muricata*, black-wattle, &c., are an advantage. Otherwise Lombardy poplar planted about 2 ft. apart does well in most places, and makes the very best of shelters. Silver-birch also makes a good shelter.

The prevailing winds, with a few exceptions, throughout the country are from the south-west and west, therefore a gentle grade to the north to north-east is the choice site for an orchard, considering both sunlight and shelter.

Compactly growing evergreen trees should not be planted on all sides of small areas, as over-sheltered orchards are more liable to damage through certain diseases than those insufficiently sheltered are by wind.

Planting.—Planting can be done in the autumn, so long as the soil is in good condition. Do not plant when the soil is water-logged. If this is the state of the soil when the trees come to hand they should be heeled in till more favourable conditions exist. In the case of heavy lands, spring is usually considered to be the best time for planting.

Cut back all broken and bruised roots before planting, and remove crossed and twisted roots.

Cutting back after planting.—The method of cutting back after planting depends on whether the tree has been grown as a whip or headed tree. In the case of the whip, cut back to 18 in. or 20 in. from the ground, leaving a stub above a bud growing away from the wind. The effect of the stub and the pressure of the wind will help to keep the centre of the tree open.

With the headed tree remove all growths excepting three best placed to form the future head. To encourage strong growth these should be cut back hard, and in such a way as to keep the tree well open and to increase the number of branches. If both these objects are not possible, preference should always be given to shape. The number of branches can be readily increased later on.

Unfortunately, many of the nursery-headed trees do not lend themselves to be thus readily dealt with. Two strong central growths with one or two weakling branches often comprises the

tree. In this case the ill-formed fork made by these growths renders the removal of one of them necessary if for no other reason than the future stability of the tree. If the heading has been done low enough the other can be treated as a whip and a fresh head formed above the point where the tree was checked in the nursery.

All kinds of shapes between this and the well-formed head are to be found, each having to be dealt with according to its own particular growth. Always aim at keeping the tree open and to avoid bad forks. If this cannot be done treat as above or remove the head altogether and start afresh.

PRUNING THE PEACH.

One of the main essentials to successful peach-growing is to maintain the tree in a healthy state of growth, and as winter pruning contributes largely to this the work should be carefully carried out each season. In no other class of fruit-tree is the change from vigour to comparative weakness so likely to take place in as short a period as in the case of the peach grown under adverse circumstances, such as bearing a heavy crop of fruit in a dry season, especially when this is combined with bad cultivation, attacks of disease, little or no pruning in the previous winter, &c. At the same time, under normal conditions, if judiciously treated, a proper balance of growth can easily be maintained, as the tree responds readily to the knife; so much so that in the early stages pruning is apt to be overdone.

Looking over a peach-growing district you will find trees trained or allowed to grow in many different shapes. But still there are distinct types recognized, two of which I intend to briefly deal with. These are the open-centre and the full-centre trees respectively. These being the extremes, all the others are to be found somewhere between the two, embracing some of the features of one or the other or both.

The Open-centre Tree.—The open-centre tree is trained so that by the end of the third or fourth year ten or twelve main branches are set, these having a decided outward tendency, to allow of full play of light and air necessary to produce and maintain in a healthy condition fruiting-wood throughout their entire length. The pruning of this class of tree, although lighter, requires more skill than is required in pruning other types of trees. The main object is to clothe all the limbs with healthy fruiting-wood. To do this a percentage of the growth from the main limbs must be cut back at each winter pruning to provide

for a renewal of growth, and the remainder shortened in to encourage growth, especially low down on the tree. If this is not done the wood will sooner or later become exhausted through the sap being attracted to other parts of the tree, with the result that the lower portion of the limbs becomes bare, and the object of training the open-centre tree is partly lost. The advantage of this class of tree lies in the ease in which it can be sprayed and the fruit thinned and gathered. Although the crop may not be so heavy the fruit will be of better quality and colour.

Full-centre Tree. — In training this form of tree four or five well-spaced limbs are taken up as perpendicularly as possible until they reach the height of 4 ft. or 5 ft., and are then allowed to branch outward. The fruit from this tree is taken mainly from the upper portion exposed to the light.

The pruning of trees of this class, although entailing more labour, requires less skill, as there is no particular design aimed at, the main object being to maintain a healthy growth and to increase the surface exposed to the light. The labour is in thinning out and cutting back the fruiting-wood and the amount of ladder-work necessary.

The advantages of this class of tree are that the head is formed so high that it lessens the difficulties of cultivation, and in districts subject to late frosts the fruit, having more foliage protection and being higher from the ground, is less liable to damage. On the other hand, the labour of spraying, thinning, and picking is increased.

The young peach-tree is naturally a strong grower, and consequently requires less hard pruning than an apple or pear tree. At the same time, this strong growth must be steadied gradually, not only for the provision of a sturdy framework, but also to avoid having to resort to more or less heavy pruning too early in the life of the tree.

A peach-tree should be started low — that is, about 18 in. to 20 in. from the ground.

Whatever shape the future tree is intended to take, a more or less open centre should be aimed at for the first year, after which the branches may be trained according to the shape of the tree desired. For the first couple of prunings all growths other than those required to form the tree should be removed.

Treatment of Fruiting-wood.— The peach bears its fruit on wood of the previous season's growth, a removal of which must be provided for at the time of pruning by cutting back to the base, or to the first bud from the base, a percentage of the wood

made the previous season. In doing this endeavour to space the growths as well as possible, whilst those remaining can be shortened in to within five or six blossom-buds of the base, unless the variety is one of those that forms its blossom-buds only towards the end of the twig, and in that case shortening-in should not be done.

The general tendency of the peach is to set much more fruit than the tree can mature satisfactorily, the surplus having to be removed by thinning. If carefully done, there should be little danger of overpruning as far as fruit is concerned, whilst a good deal of the labour of thinning can be saved. All dead and exhausted wood and twigs that have borne fruit should be removed, and leaders cut back sufficiently to ensure a healthy growth.

THE POULTRY-YARD.

F. C. BROWN.

THE CONFERENCE.

I MOST heartily congratulate the officials of the New Zealand Poultry Association, as well as the delegates thereto, on the conduct and results of the annual conference held during Easter-time in the City of Wellington.

The time of conferences in the past has been largely taken up with discussions on the constitution, there being a want of unanimity as to what should be the objectives of such a body. Some adherents considered it should be confined to fostering the interests of keepers of utility poultry, while others contended that it should be a convention of delegates from egg circles and similar co-operative enterprises. Now, I am glad to see, finality has been reached, and the constitution has been broadened to include, as it should, every individual in the country interested in poultry. It is now open to any poultry-keeper to become a member of the association and a participant (without the right of voting, however) in the annual conference by the payment of a small annual subscription of 2s. 6d. The subscription for an active member, carrying with it voting-power, is 10s. 6d. Now, it may be conceded, the association has quite settled its constitution, and will be able to give the whole time of future conferences to educational and topical subjects. With its present broad outlook, and with a maintenance of the standard of the delegates of this year, there is every reason to believe the association will become a powerful factor in the advancement of the

industry. It speaks well for the business of utility-poultry keeping in this country that the conference should bring out an array of young men capable of expressing clear-cut ideas on the problems before them in a most convincing manner. The interests of poultry-keeping in this country at the present time are certainly in the hands of men—aye, and women too—of keen intelligence and capacity.

It is gratifying to have the warm appreciation of the conference — attended by some of the foremost breeders of poultry in the Dominion — of the capacity of the two Assistant Poultry Instructors recently appointed, Messrs. C. Cussen and A. E. Salisbury. As I remarked at the conference, the two instructors who have been appointed to assist me will be continuously engaged in carrying the elements of profitable poultry-keeping to farmers and poultry-keepers in all parts of the Dominion.

The conferences of the association are destined to become the annual rallying-place for New Zealand poultrymen. Under the present policy the meetings can be made very attractive and capable of executing much beneficial influence. The event could be made of greater educative value, however, were it made the occasion of an Annual Utility Poultry Exhibition. Not so much a display of birds, but an exposition of up-to-date appliances, models, disease specimens, drawings, photographs, &c., as well as demonstrations in egg-packing, plucking and dressing poultry, &c. Such an exhibition, which is capable of being made highly interesting as well as of great practical value, would involve little expenditure, while in time it could be developed into an exhibition which would be of great national importance, bringing visitors from all parts of the country as well as presenting an attraction for city residents, thereby providing a "gate" which would probably make the scheme self-supporting. To stimulate interest and to encourage publicity of new ideas an annual prize could be awarded for the most original idea in poultry-farm equipment, the competing models to be displayed at the exhibition. I commend the idea to the conference committee.

PRESENT-DAY DIFFICULTIES.

Many difficulties are being experienced at the present time, and some of these are so common that it is well to deal with them here. The use of vegetables and green stuff has been recommended as a good means of bulking up the morning mash, but this can be easily overdone, especially with the difficulty at present experienced in securing pollard of a satisfactory quality.

It is only to be expected, if a great mass of watery food dried off with a very little pollard (which is more like bran than the genuine article) is fed to fowls, that scouring will result, and the bird's egg-laying power be reduced in consequence. The trouble has been accentuated in some instances by providing too much stimulating material, such as meatmeal or dried blood. By the poor morning mash the bird's vitality is weakened, and while in this condition its egg-laying power is unduly forced by the feeding of the concentrated meat substitutes. Little wonder that under these conditions the egg returns are unsatisfactory, and losses are of daily occurrence through ovarian troubles, such as protrusion of the oviduct. Even under the best systems of feeding the use of stimulating meat substitutes can easily be overdone. For this I strongly recommend that meatmeal and bloodmeal, or even boiled meat, be never mixed with the mash, but that they be fed separately, so that each bird may only take what it needs, and nature will always guide it safely in this respect. If the bird has the opportunity it can be depended upon to balance its own ration better than we can do it. It may be argued that pens in egg-laying competitions have done very well — in fact, established records — though the ration was prepared for them (the animal matter being mixed with the mash), and they were given no choice in the matter; but in these cases the birds were of a fairly even type, and we have no evidence before us to prove that they laid better than they would have done had they been permitted to balance their own ration. In the ordinary flock, however, where there is generally great variation in laying-power between the various birds, it is obvious that one set ration is not suitable to all alike, and that what is food for one is practically poison for another.

Though it is possible to reduce the cost of feeding by providing abundant green stuff, and generally ideal conditions, there is a point beyond which we cannot go — when cheapness becomes false economy. With its great artificial production the modern fowl must have a due proportion of solid material, and if this is not supplied the egg-yield must suffer, and no stimulant will help it. Particularly is it necessary to feed sufficient solid material in the unnatural laying months of winter. Two food-materials which are comparatively cheap at the present time are maize-meal and peameal, which may be used to great advantage at the present season of the year in the morning mash or in the dry-mash hopper.

I am being repeatedly asked day after day what is the best means of reducing the feed bill. From the conditions described

the best answer I have been able to give is to reduce the flock rather than reduce or weaken the ration. I believe it will generally pay to cull the second-year bird under present conditions as soon as it commences to moult, but I would rather keep the vigorous second-season layer than the pullet that has been half starved during its growing stage. I have actually known people who believed that the birds should be so fed that after each meal they would follow the feeder, looking for more. Happily such heresy is passing away, and some of our most successful breeders believe that it pays well to keep feed before the high-type layer the whole time. It has never been proved that it is possible to overfeed the high-type laying-bird or the high-type dairy cow yet, providing, of course, the feed is of the right quality. A bird may certainly overfeed itself which is starved one day and fed to overrepletion the next, or when given inferior food at one time and then supplied with a good appetizing ration.

Special care should be taken in feeding the pullet about to lay. The feeding should be regular, and no experimenting should be attempted. Then it should be made as appetizing as possible, and no unnecessary variation in the food supplied should be permitted. Probably there has been no season in which the false moult has been so prevalent as in the present one. This has been due to several things—insufficient food, inferior food, and too many changes in the system of feeding, as well as the common cause, change of quarters.

THINGS TO REMEMBER.

Do not neglect the green-food supply.

Overcrowding the laying-house is one of the most serious mistakes in the business.

The moulting bird intended for the breeding-pen should be well fed.

Feeding in the house is better for the fowls and, where small birds are troublesome, is better for the pocket.

If the birds are induced to stand about in a wet yard in cold weather waiting for food the egg-yield will suffer.

In selecting cockerels for breeding purposes make sure that they have the desired constitution.

The egg-yield is largely determined by the class and quality of the food supplied.

Instinct in the high-type layer demands adequate supply of animal food.

THE APIARY.

F. A. JACOBSEN.

IMPROVED-QUALITY HONEY.

THE Dominion of New Zealand is a country particularly adapted for agriculture. Most of our produce is of a superior quality, and our first grades of honey compare favourably with the best produced in other countries. The producers can, however, improve the general quality to a wonderful extent, and just how to do this was fully explained in the apiary notes of August last. Any honey which granulates with a sandy grain loses grading-points, and these few points may be necessary to place the produce as special grade. No beekeeper should fail to improve the quality of his honey to the best of his ability, and although nature supplies the aroma and flavour, which cannot be altered, improvement in the grain can be effected with little trouble. The difference before and after treatment would probably be the difference between "special" and "prime" grade. I strongly advise every beekeeper whose honey is sandy-grained to give the treatment a trial, and there is not the slightest doubt that he will be gratified with the result.

Honey granulates upon standing because of the ability of its dextrose to assume a crystalline form much more readily than the levulose. The dextrose, then, frequently gathers together in small crystals before the levulose has time to form a similar condition. Introduce a system whereby they will both granulate at the same time and the difficulty is solved. Ten pounds of granulated honey to one half-ton of liquid is the recipe of success in this instance. Mix the granulated honey with a quantity of the liquid until it becomes soft, then thoroughly stir half of it into the half-ton. Stir the other half in the next day, and keep stirring for half an hour. Stir twice a day until the honey is so thick it will just run; this will be in three or four days, then tin up immediately. The granulated honey acts as a starter to the liquid and sets up granulation, while the action of stirring breaks up the dextrose crystals and permits of an equal granulation.

To clearly indicate the degree of perfection resulting from this system of enforced granulation I would strongly recommend that a jar of the liquid untreated honey be set aside to granulate in the usual course, and be then compared with the treated honey.

It also appears to me reasonable that honey treated in this way would retain more of the delicate flavour and aroma characteristic of its source of production than would otherwise be the case.

Blending various grades of honey to secure an even quality throughout should also attract the interest of the producer. A few of our Dominion honeys are excellent in all respects except their insipid flavour. To blend with these a full-flavoured honey would do much to improve the general quality.

NOTES.

Owing to the poor season experienced in the Dominion, bee-keepers will no doubt feel inclined to leave their colonies short-weight stores for the winter. Do not under any circumstances be actuated to participate in this "penny wise, pound foolish" scheme. As I have stated in these columns many times before, the foundation of next season's honey crop is laid the previous autumn by leaving ample provision for the bees' nourishment and general welfare: 40 lb. in Taranaki and from 30 lb. to 35 lb. in other districts where there is a supply of spring nectar from outside sources should be left within the hive for winter stores.

THE GARDEN.

W. H. TAYLOR.

VEGETABLE-CULTURE.

THE soil being now in a moist condition, and easily worked, advantage should be taken of every opportunity to improve its capacity for cropping. I would point out that these articles are intended to refer to vegetable-gardens proper, and not to fields. A properly managed vegetable-garden should be capable of producing crops at all times regardless of weather-conditions, with, of course, some variation in quality, as weather will have some effect. If proper measures are taken there is no reason why adverse weather should cause an absolute dearth of vegetables on any place. One advantage of having a fixed site for a vegetable-garden is that it gives opportunity for cultivating it in a thorough manner. When the soil is cultivated only one spit deep the crops are affected by every change of weather, because the roots are near the surface, the unbroken soil being either too hard for them to penetrate it or too poor to offer them any inducement to do so. Again, during the rainy season it may be too wet for the roots to live in it. The reason why trenched soil will grow better crops than that which is only surface-dug is not generally understood; if it were, trenching

would be more general. The practical effects are, however, well known by all who have practised this method of cultivation. It is easily understood that when the roots are deep down they are to a large extent protected from adverse atmospheric conditions, and this alone should show its importance. Plants whose roots are near the surface suffer severely from drought, because water near the surface is quickly evaporated. If there are facilities for watering, and this is done, the results obtained may be disappointing. Much of the water is wasted by evaporation, and as such treatment draws roots to the surface there is an increasing need for more. It must not be thought that I consider it wrong to water, but I do consider it a lazy man's way to waste water on untrenched ground. The method is only partially effectual after all. Plants do not absorb their food through what we call the roots, but through minute hairlike formations on the roots. These, being so minute, are easily destroyed by excessive dryness or by too much wet. It is these feeders that perish when roots are scalded by watering in hot weather, as happens in some places. When soil is first trenched the top soil should be kept on top, for the lower soil will be unfertile. Trenching should be accompanied by manuring, or at least by the addition of material of some kind that will tend to keep the soil open and enrich it. Farmyard manure or stable manure is the best material to use. Whatever is buried, of course, decays in time. Its first purpose, in addition to its mechanical effect, is to feed the plants, the roots of which go down after it. The lower layers of soil become improved and enriched by the breaking-up and the additions made, and also by a portion of the manure and fertilizers put in the top layer being washed down. Thus after several seasons the bottom soil will be richer than the top, and it should then be re-trenched, bringing the bottom soil to the top. The work will be comparatively easy this time, the soil being easy to work, as the top spit will go to the bottom. Re-trenching is an important part in the economical working of the garden. It restores fertility when the top soil is exhausted, sweetens the bottom soil, and keeps the whole in good working-order. It effects a change of surface without changing the site, and reduces the use of fertilizers to a minimum.

Some crops cannot be grown in shallow soil or without manure. Celery, in particular, is a very gross feeder, and requires plenty of manure and water. Celery is a most valuable vegetable, and is seldom troubled by insects or disease unless unusual weather prevails or incorrect treatment is adopted. The many uses to which this vegetable can be put should induce efforts to grow

it well. When celery trenches are made in trenched ground all is easy, and in normal seasons it will not require much watering, for its roots will be down in rich soil. If grown in shallow soil, however, no amount of watering will produce good stuff. The proper growing of celery improves the ground immensely, the deep trenching, manuring, and cultivation in banking up causing it to be sweetened and enriched. Very fine crops of other vegetables usually follow celery. The very best of tall peas can be obtained from such ground, so that though celery demands an extra amount of labour it is labour that is doubly productive. To hark back to the beginning of this article, these remarks were caused by impressions I have received by noting how many there are who get no vegetables in a dry season, and by others who try (and largely fail) to make water take the place of cultivation. I mean good old-fashioned work—work that brings its reward in good seasons and in bad. My early training was in places where everything was done well. It stood by me when for many years I had to grow vegetables and flowers in a dry place, where there was scarcely a gallon of water to waste.

CURRENT WORK AMONG CROPS.

If seedling *cabbages* and *cauliflowers* are infested by moths sprinkle some soot among them. It will do good as a fertilizer in any case. If the young plants are attacked by caterpillars dress them with "Catakilla." Lift and store potatoes while the soil is fairly dry. Leave *carrots*, *parsnips*, and *Jerusalem artichokes* in the ground; they keep best there.

Seakale, being now bare of leaves, or nearly so, may be forced at any time. The four sides of a kerosene-case, with the lid laid loosely on top, will do to cover them. Surround and cover the cases with fermenting manure. The heads are usually ready in two weeks after covering. After cutting the heads leave the top open. When the new shoots appear remove the boxes, so that they may become drawn.

Cut down *asparagus* before the ripe berries fall, taking care to cut level with the ground or the stumps will be in the way of working. Give a good dressing of stable manure; but if the asparagus is planted in narrow beds in the old way, first rake off the soil down to the crowns, and then give a good coat of manure. The soil is to be left off till spring, when it is to be put on top of the manure, which will have rotted down to small dimensions. The object in putting the manure on now is to allow time for it to get washed down to the roots, so these may reach it as soon as they become active, which would not be the case if it was not put on till spring.

Carrot-seed put in now will yield small roots that will stand a little later than the old roots, securing a supply for flavouring purposes till the spring-sown crop comes in.

Turnip may be sown if the supply is short; they are not likely to get large, but may prove useful.

SMALL FRUIT.

Strawberries.—Runners that are to be planted out should not be left on the old beds. They make no advance on the trodden and root-crowded soil. Take them up and plant them in nursery rows in a good plot of ground. Plant about 4 in. apart in rows wide enough to allow of hoeing, if necessary, to keep the soil loose. In this position they will make a lot of new roots, and the advantage will be apparent when they are lifted for the final planting. Clear worn leaves from old beds, and if possible give a mulch of stable manure. Winter rains will wash it in and enrich the soil for the start in spring.

Raspberries and *gooseberries* may likewise be given a dressing of manure. Early manuring is recognized as being best.

Cape gooseberries in their second year may be cleared away when fruiting is past. If first-year plants, leave them for fruiting next season. The tops should not be cut down till spring, as they serve to protect the spring growth from frost.

Loganberries. — Cut out the old wood that has borne fruit; cut right away to the stool. This will leave more air-space for the ripening of the rods.

THE FLOWER-GARDEN.

The remarks about trenching the vegetable-garden are equally applicable to the flower-garden. It is only with soils that are loose that uniform success with various plants can be hoped for. When soil is not specially favourable, planting without preparation simply results in the survival of the fittest. A small patch properly worked will give more satisfaction than a large area unfit for general growth. Soil not trenched, unless it is naturally loose to a considerable depth, feels all the changes of the weather, and plants are affected accordingly.

Roses may now be transplanted. It is, indeed, the best time to do so. If transplanted now, they make new roots straight away and become re-established before winter. Top-heavy shoots and straggling growths may be cut back to some extent (just enough to enable the plant to stand firm when replanted), but pruning in the proper sense must not be done. It is foliage on the plants that enables them to make new roots.

Transplant *primroses* and *polyanthus*, but not *violets*. Violets should not be disturbed at this time except for special reasons. After flowering in spring is the correct time to move them.

Shrubs and trees of all kinds may be transplanted, as well as most herbaceous plants. Anything in the way of *bulbs* or tubers that are dormant may be moved.

Seeds of hardy plants such as *gaillardias*, *antirrhinums*, &c., may be sown in the open ground in nursery beds. Whenever this can be done it saves labour, as against sowing under glass. *Pentstemons* and shrubby *calceolarias* can be easily increased by cuttings put in during May. Shoots of the current season should be used in each case. Pentstemon-cuttings 4 in. or 5 in. long will root in ordinary soil. Calceolaria-cuttings should be from 3 in. to 4 in. long, cut just below a joint and with the leaves shortened. Just cut the tips of the leaves off. Dibble the cuttings in just clear of each other in a rather shady place. Surface the soil with sand. Practically every cutting will root.

THE HEMP INDUSTRY.

W. H. FERRIS.

THE output of phormium-fibre last month showed a good increase in quantity, and, with the exception of fibre from the Auckland district, exhibited an improvement in quality. The larger output was due mainly to the improved market value, and in a minor degree to the break-up of the drought. Owing to the dry weather and no water being thereby available for washing purposes, many mills in the Nelson and Auckland districts were unable to resume operations till last month. The drought also affected quality in some cases, where water required for washing the fibre was in such short supply that the colour was affected. No doubt this is responsible for the poorer qualities of fibre milled in the Auckland district last month. The advance in quality in other districts is no doubt due in large measure to the improved conditions now ruling, enabling stripper-keepers and others to make the best use of the good leaf generally available this season. The quarter's figures indicate a very gratifying reduction in the proportion of "common" and "rejected" lines, for which the diseased leaf so prevalent during the two previous seasons and the good leaf of the present season provide the key. The low figures also indicate a splendid advance in quality. Here again the diseased leaf of last

season was responsible for the high percentage of the inferior lines of the by-product then produced. The most satisfactory feature of this season's operations is the good work being done by stripper-keepers in general. The machines are apparently being kept uniformly tuned up to effective work, while the stripper-keepers are being assisted by having satisfactory leaf to deal with.

The good prices ruling for phormium-fibre are inducing many millers to adopt the most up-to-date methods. In the Manawatu district Mr. W. Bock has introduced an improved automatic Suttie and Wynyard scutcher and tow-shaker. In the Wairoa district Mr. M. Bourke has decided to erect a modern two-stripper mill in the township, while his swamp is being thoroughly drained. This will be the means of considerably extending the area of flax suitable for milling purposes, as it should improve the general quality of the leaf in areas unsuitable at the present time for milling purposes.

The following tables show the quantity and quality of phormium-fibre produced in the Dominion during the first quarter of the present year and the corresponding quarter of last year:—

QUANTITY AND QUALITY OF HEMP EXPORTED.

Month.	Superior.	Fine.	Good-fair.	Fair.		Common.	Rejected.	Condemned.	Total.
				High Point.	Low Point.				
	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.
January ..	..	261	2,707	3,127	662	152	31	3	6,943
February ..	..	325	3,378	3,591	1,017	134	31	1	8,477
March ..	..	190	3,309	4,994	683	91	102	4	9,373
Totals ..	..	776	9,394	11,712	2,362	377	164	8	24,793
Percentage	..	3·12	37·9	47·2	9·52	1·53	0·66	0·03	..
Corresponding quarter of 1914	..	461	11,852	17,604	8,042	1,807	154	130	40,050
Percentage	..	1·15	29·60	43·95	20·08	4·50	0·38	0·32	..

QUANTITY AND QUALITY OF TOW EXPORTED.

	First Grade.	Second Grade.	Third Grade.	Condemned.	Total.
	Bales.	Bales.	Bales.	Bales.	Bales.
Quarter ending 31st March, 1915 ..	1,490	3,528	1,161	88	6,267
Percentage	23·75	56·33	18·51	1·41	..
Quarter ending 31st March, 1914 ..	1,224	5,578	5,449	635	12,886
Percentage	9·5	43·3	42·3	4·9	..

THE SCENE AT THE OFFICIAL OPENING OF THE NEW ZEALAND PAVILION AT THE PANAMA PACIFIC EXPOSITION.

COMMERCIAL INTELLIGENCE.

CANADIAN TARIFF AMENDMENTS.

THE Agent of the New Zealand Government at Vancouver reports as follows on certain proposed alterations in the Canadian tariff :—

Changes are about to go into force in connection with the Canadian tariff, necessitated, as a war measure, by the increasing expenditures which Canada is being called upon to provide, and to supplement revenues which have been largely curtailed by contraction of trade. These contemplated changes are not at the moment in force, although they are accepted, and all entries now being passed bear the legend "Subject to amendment." It is the intention to advance all preferential duties, to which New Zealand is entitled, 5 per cent., while general rates are being advanced (and under these Australia will come) 7½ per cent. This advance will, of course, apply to New Zealand butter and other produce, but it is almost a matter of congratulation, I might say, that New Zealand will enjoy thereby a still greater preferential over the Australian products. This is a condition which is not unwelcome, particularly for the reason that Australian butter has been coming in here of late, and, in the view of many dealers, is being exploited to the detriment of the New Zealand article.

It is noted further, in connection with contemplated changes in the Canadian tariff, that the fruitgrowers' associations of British Columbia consider that they do not have adequate protection against foreign competition, and to this end are approaching the Government to assist. This is merely mentioned in view of the fact that New Zealand exporters have been looking to this market for an outlet for their fruit. It may be, of course, that nothing will be done.

WHEAT-GROWING IN CANADA.

THE majority of correspondents maintain that with low prices prevailing for grain it is almost impossible to subsist without engaging in mixed farming. A large number of farmers feed all their grain to stock on the farm, for, with the prices of live-stock and their products increasing, the grain is worth more for feeding than it is for selling. This is also the better method, because what is taken out of the soil in the production of grain is returned to it in the form of farmyard manure. Fertility is thus maintained, and in the case of failure in one line of produce another generally succeeds. It is also pointed out that the practice of mixed farming ensures cleaner and richer land and cleaner grain; it permits of the best rotation of crops, and where there is waste land, such as rocks, &c., it is the only possible way to farm. Other advantages claimed for mixed farming are that labour is provided for all the year round, that a home market is created for cheap fodder, that it encourages improvement in the breeding of live-stock, and that it renders the farmer more independent of the season and of climatic changes. In Manitoba and in Saskatchewan a feeling seems to be gaining ground, even amongst those farmers who do not practise mixed farming, that it is the best method. There are, however, difficulties in the way of its more general adoption. The prairie farmers state that these are mostly the lack of capital, the high cost of fencing, building-materials, and labour, the need of fresh water, the lack of pasturage facilities, the herd law, and the high rate of interest.—*The Census and Statistics Monthly, Canada.*

ANSWERS TO CORRESPONDENTS.

CORRESPONDENTS are requested, when desiring information through the Journal in regard to disease in animals and plants, to forward, where possible, affected specimens, in order to facilitate a correct diagnosis of the trouble and to ensure the best advice. In stating a question the most complete descriptive details should be furnished.

Correspondents desiring information in regard to manurial treatment of soil are requested to fill in and forward the prescribed form—"Application for Advice as to Manurial Treatment of Soil"—obtainable from any office of the Department in the Dominion.

In every instance a question to which an answer is desired in these columns must be accompanied by the full name of the inquirer, not necessarily for publication, but as a guarantee of good faith. The question should be written only on one side of the paper.

RENOVATING OLD PASTURES.

W. R. HUTCHINSON, Hukerenui :—

Is there any available means of establishing the values of the methods now in use in cleaning old pastures? The present drought is the cause of fires being used to renovate old pastures, by destroying all vegetation so as to obtain potash and other salts from the fires, and then to apply basic slag in the autumn. Is this method of reduction in plant-life to be preferred before allowing the old dry grass going back to the land as a fertilizer, or what is the value of, say, a 6 in. deposit of old vegetation going back to the pasture against the indiscriminate method of burning, and purchasing the slag?

The Fields and Experimental Farms Division :—

There are no means of renovating old pastures other than those of actual experience and observation of comparing the values of methods, be it burning the grass or otherwise, of cleaning old pastures. The burning of the old grass, unless it be on strong land, is not considered good practice. There is a danger of injury to the sole of grass, and this danger is increased during a dry season. The actual quantity of potash accruing from the burning of the grass does not amount to very much. All things considered, it is better to practise judicious grazing and treatment of the pasture area than to risk injuring the lea with firing. Cattle should follow sheep, where possible, to clear up the rough herbage or to assist it to return to the soil. The extent to which this can be accomplished is determined by the weight of stocking. Pastures that have been judiciously grazed in this manner and well stocked should not show much surplus of rough dry feed. The harrowing of the pasture area in the spring, to spread the droppings of stock, also assists greatly in providing a uniform sward, with a due proportion of coarse vegetation. The practice of a rotation with the pasture crop is also worth observing, as also is the occasional spelling of paddocks for short periods. As milk-producing animals and young bone-producing stock are harder on pastures than mature fattening animals in that they return less mineral substances to the soil in the manure, this fact is also worthy of consideration in arranging the rotation according to the class of stock and the character of the herbage. As mineral substances (lime, phosphorus, and potash) promote the growth of the finer grasses and clovers, mature fattening stock should where possible be grazed, as far as is consistent with the fattening process, on pasture lacking such desirable vegetation. Having

attended to the grazing judiciously according to these natural lines, the use of basic slag alone on the heavier soils, and with kainit on the lighter soils, will complete the renovating process, providing the vegetation is present to respond to the treatment. It is preferable to allow the vegetation to return to the soil either through the animal or naturally under his feet than to fire the grass, as a certain amount of nitrogen and carbonaceous material is lost to the soil by the burning. Besides, the vegetable covering tends to conserve moisture by preventing evaporation—and this is important in dry districts—and to shelter the tender grasses and clovers. After firing, the coarser vegetation would beat the finer, and the result would invariably be a less nutritious pasturage. Thus by burning you not only cause a loss or evolution of nitrogen into the air, but you minimize to some extent the power of the pasture-mixture to acquire nitrogen from the air through the diminished clovers. As slag does not supply nitrogen, and firing causes a loss thereof and of carbonaceous material, this artificial method would be less economical than the more natural method of judiciously grazing assisted by minerals.

TROUBLE WITH LAYING-HENS.

"POULTRY-YARD," Waikato :—

What is the cause of and a cure for hens that strain their laying-parts and then die. It protrudes out about the size of an egg. We feed on grain in the morning and a big supply of milk all day. The fowls have a free run.

The Live-stock and Meat Division :—

This condition is generally brought about through your supplying forcing-foods, such as meat, its substitutes or condiments. Milk is also of a forcing nature. This, with the quantity of insect-life picked up by the birds on their free range, is probably responsible for the trouble. I would, therefore, advise you to reduce the quantity of milk now being supplied. I may point out that birds of a weak constitution are very susceptible to troubles of this kind. Perhaps the introduction of fresh blood into a flock would do much towards preventing a recurrence of the kind. Of course, prevention is at all times better than cure. Provided the bird is attended to soon after the protrusion takes place it may be cured. First apply salad-oil to the affected parts, and gently force them back into the vent. Then place the bird in a kerosene-case, care being taken to keep the rear end slightly elevated. This may be done by fastening a piece of string round the legs and tying it to a nail driven in at the top of the end of the case. The patient may be made comfortable by putting a sack on the bottom.

MAIZE AS GREEN FEED FOR DAIRY COWS.

"CAMPUS," Otaki :—

When cows are on a fair grass pasture about what quantity of maize a day should be each cow's ration? In making maize into ensilage, can it be stacked and weighed, or can it be placed whole in a silo, or must it be chaffed and siloed? Is more maize procured per acre by sowing 30 in. to 36 in. between the rows and keeping cultivated, or by drilling 7 in. between the rows, or by broadcasting?

The Fields and Experimental Farms Division :—

When cows are on a fair but not a full pasture they can each be fed to advantage 40 lb. of chaffed matured maize per day. Should the pasture be going off, the quantity can be increased to 60 lb., according to the condition of the herbage. If you have lucerne hay or ensilage available it would be more economical to feed this with the maize, to balance the ration. 12 lb. of lucerne ensilage and 21 lb. of maize per day makes an excellent ration for a cow receiving a little extra feed. This ration increases the milk-supply as compared with the single maize ration. Another good combination, although not so good as lucerne ensilage and maize, is that of 20 lb. lucerne hay and 12 lb. maize ensilage. It is by far the better practice to chaff and silo the maize. From the point of view of economy and ease of handling, also as producing a better silage, the siloing method is preferable. It is possible to make ensilage by using whole maize in stack or in silo, but it is much more difficult. The exclusion of the air—the main prin-

ciple in the making of ensilage—is the great difficulty, and the handling of the resulting product is much more troublesome, especially as regards the silo-made material.

While a greater gross weight of maize fodder is obtained by the thick sowing, yet the nutrient value of it is considerably reduced owing to light and air being to some extent excluded, thereby interfering with the efficient operation of the functions appertaining to plant-nutrition. Maize for fodder should be sown a sufficient distance apart to allow of the first (or bottom) leaf not becoming yellowed through lack of sunshine and sufficient air. When that same first leaf becomes yellow naturally, due to the ripening process setting in, it is time to cut the crop for green fodder or ensilage. Where corn is fed as it is cut from the field, however, it is well to start earlier than the ripening of the first-leaf stage. The sowing of maize in rows 30 in. to 36 in. apart is preferable, then, to sowing it closer. The fact that intercultivation can be carried out when sown at the greater distance apart also enables bulk to be encouraged by fairly frequent cultivation. In a dry season one good cultivation is equal to a shower of rain.

PROTECTING WATER-PIPES FROM FROST.

"WAINUI," Mangaweka :—

I have water laid on to various parts of the homestead on my farm, and am afraid the frosts, which are very severe here, will split the pipes where exposed. I propose to cut sacking into strips, soak them in tar, and bind the pipes with that. Would this be effective? If so, would the tar require to be boiled, and should the pipes be wrapped while the tar is hot? Could you suggest a better method of protecting them if the above is doubtful?

The Fields and Experimental Farms Division :—

It is assumed that the pipes you have used are of burnt clay. The fact that the frost is affecting the pipes indicates that you have not got them in deep enough. In Canada, where they have considerable frost, tiles or pipes are put in at an average depth of 3 ft. where farms are underdrained. At this depth they are below the severe-frost zone, and rarely are the pipes affected to any extent. The outlet into a large open ditch or creek is protected by using a corrugated galvanized-iron pipe for a few feet. These can be obtained in different sizes. Where your pipes are unavoidably near the surface you could use sections of piping of this same material and construction. The insulation with tarred sacking undoubtedly would help a good deal, but the above-mentioned system is more satisfactory and less troublesome. Should you decide to use the tarred-sack method, we are of opinion that the coal-tar would require to be brought to the boil and applied hot. If, however, it is iron pipes you have, putting them into the ground at an average of 3 ft. deep should preserve them from frost. Where they are unavoidably placed shallow, or where they are exposed, they could be protected with a good covering of tarred sacking.

LUCERNE.

J. SUTHERLAND, Palmerston South :—

I am thinking of trying about a couple of acres of lucerne next spring. I have been told that it will not do down here, as the land, although good soil, has a clay subsoil, and that as soon as the lucerne-roots strike the clay it seems to die away. I sowed a small patch last spring, which seems to have done all right. Could you let me have your opinion in this matter?

The Fields and Experimental Farms Division :—

Where the land is well drained (the water-table at least 5 ft. from the ground-surface, on the average) and the subsoil is fairly open, or has been rendered thus by subsoiling, it should grow lucerne successfully, provided, of course, proper cultural conditions are attended to. The soil you refer to could be made to grow lucerne well by using a single-furrow plough, with mouldboard removed, in the furrow made by a full-mantled plough. The subsoil is therefore opened up considerably for lucerne-root penetration. If, of course, the substratum is specially stiff the crop will have difficulty in establishing itself.

GROWING HAWTHORN.

"SUBSCRIBER," Ngaio :—

How are white-thorn plants to be grown from haws? I have often tried, and got no result.

The Orchards, Gardens, and Apiaries Division :—

Seed with a fleshy or tough covering, such as white thorn, holly, &c., should be mixed with damp sand (in about equal proportions), when quite ripe, immediately they are gathered, and left in the open till the following season. Frequent turning is necessary to thoroughly rot the pulpy matter. The seed can then be sown in the late autumn, and should germinate in the following spring.

CRACKED HOOFS.

MARTIN BUTLER, Cambridge :—

Would you kindly inform me the best treatment for cows with cracked hoofs?

The Live-stock and Meat Division :—

The treatment will depend upon extent and nature of crack. If the crack is inclined to extend upwards towards the hair, its progress may be circumscribed by firing across the upper limit of the fissure by means of a hot iron. A line about $\frac{1}{8}$ in. deep should be burned in the horn. If the crack extends downwards from the hair towards the ground-surface, a line burned in the shape of the letter V on either side of it will prevent the crack from becoming wider.

It may be necessary to apply a blister around the coronet to stimulate the growth of fresh, sound horn. Cows whose feet are inclined to crack should have them dressed daily with crude cod-liver or castor oil.

SHEEP AFFECTED WITH DISEASE.

"SHEPHERD," Waipawa :—

The lambs on this station are affected with what is commonly known as "staggers." When they are disturbed odd lambs take short, jumpy strides, and then fall over, with the head strained back and the neck very stiff. After a minute or so they get up again, and then repeat the performance. If left alone they gradually recover themselves and go on feeding. They are on very dry and bare feed, but have access to good water. Some of the older sheep are affected similarly, but very few. Would you kindly inform me the name, cause, and cure of the disease?

The Live-stock and Meat Division :—

The trouble referred to probably arises from constipation due to excessive dry feed. Symptoms of "staggers" are very often due to a torpid condition of the bowel, resulting in absorption of effete material into the blood, whence it is conveyed to the brain, producing symptoms similar to those described. Where change to green, laxative feed is unobtainable little can be done. A run on the turnips, when these are available, is very beneficial in such cases. Epsom-salt, 1 lb. to the gallon of water, might be tried where there are facilities for watering from troughs, the access to other water-supplies being barred. The essential, however, is change of feed.

GUM-TREES.

F. ST. OMER, Queenstown :—

Would you kindly let me know if it would be advisable to plant young gum-trees in the autumn, and what month?

The Orchards, Gardens, and Apiaries Division :—

In most districts autumn planting is preferable. The work should be undertaken directly the nurseryman can supply the trees after the hot weather has passed. If the locality is subject to very heavy frosts, then it is desirable to plant in the early spring.

HAIR-DISEASE OF HORSE.

D. ELLWOOD, Christchurch :—

I have recently bought a fine bay gelding. Unfortunately, nearly all the hair has fallen from the tail, mane, and from all places where the long hair grows. Will you be good enough to tell me the reason and if anything can be done ?

The Live-stock and Meat Division :—

The horse may be suffering from mange or some skin-disease which induces shedding of the hair. Wash the tail well with soft soap and water containing a little ordinary washing-soda. Get the following dressing made up, and apply to the hairless parts every day : kerosene oil, 2 parts ; linseed-oil, 1 part ; soft-soap solution, 2 parts. Mix the two oils, and then add the solution of soap, stirring well. The soap-solution is prepared by dissolving ½ lb. soft soap in a gallon of warm water.

YELLOW-WATTLE (MIMOSA), ACACIA, AND PINUS INSIGNIS.

"FARMER'S WIFE," Waipawa :—

Please could you inform me the best time to sow yellow-wattle (mimosa), acacia, and *Pinus insignis* ? Would I have to scald the wattle-seed in boiling water ? It is very dry ground where I wish to sow the seed, for shelter plantation.

The Orchards, Gardens, and Apiaries Division :—

The most suitable time to sow acacia (wattle) and *Pinus insignis* seed is in the spring, about September or October. Wattle-seed should be soaked in boiling water for about eight hours before sowing. This is best done by pouring boiling water into a vessel and at once tipping the seed into it. The seed should then be mixed with sand or sifted soil and sown where the trees are to remain permanently, as the wattle will not stand transplanting unless done with extreme care.

TREATMENT FOR OLD HORSE.

"INQUIRER," Taranaki :—

Could you tell us of something likely to help an old horse (twenty-six years) through the winter ? He keeps very well and fat as long as there is plenty of grass, but gets very poor on hard feed. Is "Sucrosine" likely to be good.

The Live-stock and Meat Division :—

Have the horse's teeth attended to by a qualified veterinary surgeon. There may be irregularities in them which will benefit by skilled attention. Excessive or improper treatment of the teeth will result in far more harm than good being done. Mix 4 lb. or 5 lb. of *crushed* oats per day with the chaff, and add to this ½ lb. of linseed jelly. "Sucrosine" is nutritious, and the linseed may be replaced with equally good results by the addition of ½ lb. to ¾ lb. of this food-material to the rest of the feed. Keep in a sheltered position, and provide a warm rug for cold, wet weather.

BLACKBERRY PEST.

J. C., Umukuri :—

On page 110 of the *Journal* of February reference is made to the blackberry pest and its treatment with kerosene. Could you let me have the proportions of kerosene and water used with success ?

The Fields and Experimental Farms Division :—

The only experiment I know of in regard to the spraying of blackberry with kerosene is that mentioned in the February *Journal* and referred to by you. In this experiment undiluted kerosene was used. I am afraid it would be impossible to dilute the kerosene with water, as they would not mix. In any case, I have no knowledge of this ever being attempted.

HOOF-TROUBLE OF COW.

J. STEEN HUNTER, Woodlands, Kaitieke :—

I have a very valuable cow which for a long time has had a lame foot. For a time I could not see anything the matter with the foot, but for a week or two now the bottom of the hoof has seemed crumbly, more so towards the split in the hoof. There is no discharge. I have examined the hoof, and found nothing in it. I have bathed it with hot water, using Little's fluid dip as a disinfectant, and have applied Stockholm tar, but it does not get any better. I would be pleased if you could give me some idea as to what is the matter with the hoof and what treatment to follow.

The Live-stock and Meat Division :—

Your cow seems to be suffering from a condition of foot analogous to "seedy-toe" in the horse. I would advise you to cast the animal, and thoroughly clean out all the crumbly horn. Then pack the resulting space with tow which has been soaked in a solution of 1 part tincture of iodine to 10 parts of water. This treatment will need to be carried out twice a week, a fresh dressing being used each time. To prevent undue brittleness of the horn, apply a dressing of castor-oil daily.

REFUSE OF SODIUM SILICATE AND CALCIUM CARBIDE.

"AMATEUR" :—

I have at times large quantities of used-up egg-preservative (silicate of soda) and waste material from an acetylene-gas plant (carbide of calcium). Would these waste products be of use in an orchard or garden, and, if so, how would you recommend them to be applied, especially the former? I have also a large quantity of fowl-manure every week. How would you recommend me to utilize it to the best advantage for an orchard or garden or pasture?

The Orchards, Gardens, and Apiaries Division :—

Silicate of soda has no manurial value. Used-up carbide of calcium is practically slaked lime, and if left exposed to the atmosphere for some little time can be used in place of lime by spreading over the ground and lightly digging in. Fowl-manure is best utilized mixed with soil for a while before applying to the ground. It can then be dug in for vegetables, and, in the case of fruit-trees, spread over the roots. A light top-dressing would be sufficient for pasture.

APPLE-CULTURE.—SILVER-BEET.

"REINNETTE" :—

Can you advise me as to the suitability or value of the apple Reinnette du Canada as an export variety, also as to its suitability to the Teviot district?

I should also be glad to have any advice as to method of saving silver-beet seed. I have some planted eighteen months ago, which I am allowing to run to seed in order to save same.

The Orchards, Gardens, and Apiaries Division :—

The Reinnette du Canada has not much commercial value on the export markets, and there is practically no demand for it on the English markets, where it is invariably amongst the lowest-priced apples sold on the brokers' catalogues. While it carries well, and is suitable for export as far as that goes, it is not to be classed in value along with many of the better standard varieties. It does well, and is quite suitable in the Teviot district, but I would not recommend growing it in preference to many other leading kinds.

You do not say whether you propose to save silver-beet seed on a large scale or only a little from your garden. If the latter, it will be quite sufficient if, as soon as you think the seed is about ripe, you cut off the heads and place them on a cloth until thoroughly ripe and dry. Then by shaking them in the cloth and subsequently whipping the heads with a willow wand you will probably obtain most of the seed. There are, of course, special machines for the dressing of such seed, but I imagine you only purpose to deal with a small quantity.

THE DOMINION'S EXPORTS TO BRITAIN.

COMPILED FROM MANIFESTS OF VESSELS SAILED DURING RESPECTIVE MONTHS OF CURRENT AND PRECEDING SEASONS.

Month.		Mutton, Carcases.	Lamb, Carcases.	Beef, Quarters.	Pork, Carcases.	Butter, Boxes.	Cheese, Crates.	Wool, Bales.	Wheat, Sacks.	Oats, Sacks.	Rabbits, Crates.	Hemp, Bales.	Tow, Bales.	Kauri-gum, Cases.
January,	1915	137,816	296,439	45,622	339	138,081	85,123	87,393	..	..	2,860	683	..	1,209
,,	*1914*	*231,766*	*464,185*	*30,424*	*33*	*150,492*	*136,086*	*108,742*	..	*500*	*2,851*	*15,234*	*4,306*	*11,133*
February,	1915	433,585	517,581	77,421	311	119,371	96,090	159,347	..	..	..	13,111	6,619	2,763
,,	*1914*	*354,190*	*334,207*	*14,100*	*3*	*86,570*	*59,532*	*127,372*	..	*4*	..	*3,709*	*633*	*7,607*
March,	1915	80,439	203,480	30,176	..	55,280	51,811	49,809	..	..	..	8,410	185	274
,,	*1914*	*446,522*	*551,313*	*36,689*	..	*61,060*	*62,732*	*95,175*	..	..	..	*8,187*	*2,562*	*3,958*
April,	1914	234,765	366,786	22,185	..	7,822	63,796	58,488	..	2,901	..	1,247	888	5,909
,,	*1913*	*303,937*	*647,948*	*16,834*	*457*	*11,358*	*52,934*	*61,988*	..	*300*	..	*9,049*	*3,351*	*3,889*
May,	1914	336,632	638,397	39,315	54	837	37,776	43,364	3,623	11,062	..	8,355	2,112	9,316
,,	*1913*	*418,221*	*731,520*	*22,073*	*100*	*637*	*46,304*	*33,281*	..	*265*	*2,000*	*15,751*	*5,005*	*9,057*
June,	1914	261,877	634,981	36,400	..	1,153	19,247	18,774	..	28,141	1,000	7,924	4,258	7,881
,,	*1913*	*315,034*	*528,815*	*24,444*	*588*	*79*	*3,166*	*18,741*	..	..	*13,072*	*13,592*	*4,065*	*5,439*
July,	1914	225,411	239,143	38,170	..	1,355	2,003	15,868	..	1,425	1,000	5,810	2,584	8,053
,,	*1913*	*215,713*	*331,353*	*14,030*	..	..	*1,687*	*17,169*	*5,651*	*300*	*9,190*	*9,682*	*1,720*	*10,793*
August,	1914	4,251	63,111	19,094	516	1,979	50	4,845	600	38,220	10,403	367	245	3,705
,,	*1913*	*101,593*	*178,263*	*13,129*	*6*	*8*	*407*	*8,494*	*11,604*	*45*	*38,480*	*3,714*	*2,310*	*6,406*
September,	1914	3,386	49,200	2,353	..	15,885	..	3,337	..	5,896	7,288	1,143	57	..
,,	*1913*	*133,122*	*83,521*	*5,334*	*16*	*6,575*	*2,020*	*7,176*	..	..	*16,336*	*3,826*	*1,501*	*10,049*
October,	1914	291,432	128,016	49,104	..	81,842	30,487	8,938	..	68,660	38,121	2,042	1,650	1,683
,,	*1913*	*14,122*	*25,735*	*580*	..	*42,847*	*21,452*	*2,705*	..	..	*10,020*	*6,986*	*3,672*	*2,923*
November,	1914	136,346	27,577	48,302	27	98,729	70,048	37,604	15	24,289	35,783	885	110	1,377
,,	*1913*	*20*	*1,479*	..	..	*53,468*	*23,722*	*1,891*	..	..	*2,478*	*4,162*	*771*	*2,314*
December,	1914	192,952	149,835	44,876	..	172,990	80,114	86,317	..	..	9,306	1,136	116	2,157
,,	*1913*	*128,087*	*86,890*	*8,909*	..	*249,526*	*124,821*	*51,385*	..	*250*	*24,479*	*19,807*	*5,276*	*11,273*

HEMP AND TOW GRADING RETURNS.

MARCH.

Hemp.—The total number of bales graded was 9,373, as compared with 14,455 for the corresponding month of last year, a decrease of 5,082 bales. For the twelve months ending 31st March, 1915, the number of bales graded was 80,987, as compared with 160,249 for the previous twelve months, a decrease of 79,262.

Tow.—During the month 2,192 bales were dealt with, as compared with 4,484 for the corresponding month of last year, a decrease of 2,292 bales. For the twelve months ending 31st March, 1915, the number of bales graded was 23,574, as compared with 52,213 for the previous twelve months, a decrease of 28,639.

Stripper-slips.—During the month the number of bales graded was 276, as compared with 151 for the corresponding month of last year, an increase of 125 bales. For the twelve months ending 31st March, 1915, the number of bales graded was 1,482.

HEMP, TOW, AND STRIPPER-SLIPS GRADED THROUGHOUT THE DOMINION DURING THE MONTH OF MARCH, 1915.

Hemp.

Port.	Superior.	Fine.	Good-fair.	Fair.		Common.	Rejected.	Condemned.	Total.
				High Point.	Low Point.				
	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.	Bales.
Auckland ..	..	..	288	449	110	1	..	3	851
Foxton ..	..	..	1,437	1,416	359	18	33	1	3,264
Napier	..	..	208	7	..	..	..	..	215
Wellington ..	..	132	1,028	2,679	194	72	69	..	4,174
Blenheim ..	..	25	11	30	..	..	..	..	66
Picton ..	..	33	116	12	..	..	..	..	161
Lyttelton ..	..	..	54	..	..	..	..	..	54
Dunedin ..	..	..	148	27	..	..	..	..	175
Bluff	..	..	19	374	20	..	..	..	413
Totals ..	..	190	3,309	4,994	683	91	102	4	9,373
Percentages of totals	..	2·02	35·34	53·28	7·27	0·97	1·08	0·04	0·100

Tow.

Port.	First Grade.	Second Grade.	Third Grade.	Condemned.	Total.
	Bales.	Bales.	Bales.	Bales.	Bales.
Auckland ..	..	149	117	13	279
Foxton ..	309	354	39	..	693
Napier	..	..	33	..	33
Wellington ..	146	635	31	2	814
Blenheim ..	25	21	..	..	46
Picton	..	63	..	..	63
Lyttelton ..	29	..	..	..	29
Dunedin ..	43	11	20	..	74
Bluff	..	47	107	7	161
Totals ..	552	1,271	347	22	2,192

Stripper-slips.—Foxton: Second grade, 148. Wellington: First grade, 8; second grade, 115. Lyttelton: First grade, 5.

NEW ZEALAND-SAN FRANCISCO TRADE.

FOLLOWING are the shipments of produce for San Francisco, Tahiti, and Rarotonga, and transhipments for Vancouver from New Zealand, since October last:—

—	"Maitai," 12th Nov.	"Moana," 10th Dec.	"Marama," 7th Jan.	"Maitai," 4th Feb.	"Moana," 4th March.
Gum, packages	12	10	..	30	31
Milk, cases	..	..	..	1,000	..
Grain, &c., sacks	32	169	36	10	30
Meat, cases	37	16	82	..	..
Onions, cases	2	5	9	11	..
Potatoes, sacks	3	10	26	30	..
Sundries, packages	629	403	287	435	4
Butter, boxes	4	521	180	..	7
Hemp, bales	456	331	..	..	..
Frozen lamb, carcases	5	5	2,202	..	3
Hides and sheep-skins, sacks and bales	250	88	145	2	..
Beef, quarters—pieces	..	..	20	..	7
Veal, carcases	..	..	26	..	200
Cheese, crates	..	..	154	..	..
Sheep-skins, bales	..	..	48	15	..

NEW ZEALAND-VANCOUVER TRADE.

FOLLOWING are the shipments of produce for Vancouver and North American ports from New Zealand since November last:—

—	"Niagara," 1st Dec.	"Makura," 29th Dec.	"Niagara," 26th Jan.	"Makura," 22nd Feb.	"Niagara," 26th March.
Butter, boxes	3,650	2,350	9,159	8,175	9,030
Mutton, carcases	..	..	1,041	78	..
Lamb, ,,	..	..	444	175	..
Beef, quarters—pieces	..	..	247	221	..
Veal, carcases	..	..	10	23	..
Frozen sundries, packages	..	..	17	22	..
Wool, bales	348	165	109	210	1,198
Grass-seeds, beans, &c., sacks	23	..	22	..	..
Hides and skins, sacks, &c.	2,442	1,984	1,368	1,277	996
Onions, cases	..	..	60	1,333	2,000
Sheep-skins, bales	522	501	230	136	96
Jam, cases	25	..	..	..	..
Sundries, packages	34	53	210	..	22
Pelts, casks	25	28	45	83	40
Kauri-gum, packages	10	89	..	..	53
Hemp, bales	..	..	340	264	250
Rabbits, crates	..	..	..	..	..
Timber, pieces	..	..	..	..	..
Eggs, cases and crates	255	..	..	..	..
Meats (canned, &c.), cases	..	..	..	..	..
Cheese, crates	..	..	..	..	..
Fresh fruit, cases	..	..	..	..	985

STOCK EXPORTED.

THE following table shows the numbers and descriptions of stock exported from the Dominion during the month of March, 1915 :—

Port of Shipment.	Horses.			Sheep.			Cattle.		Pigs.		Dogs.		
	To Australia.	To Pacific Islands.	To Montevideo.	To Australia.	To Pacific Islands.	To South America.	To Australia.	To Pacific Islands.	To Australia.	To Pacific Islands.	To Australia.	To Pacific Islands.	To United Kingdom.
Auckland ..	1	8	..	..	132	..	..	45	..	50	2	4	..
Napier ..	1	..	..	..	..	..	9	..	..	..	..	..	..
Wellington	28	..	..	..	..	..	7	..	..	..	3	..	..
Christchurch	22	..	..	166	..	..	24	..	..	..	3	..	2
Dunedin ..	..	..	..	..	..	..	..	..	..	..	..	..	1
Totals ..	52	8	..	166	132	..	40	45	..	50	8	4	3

Auckland also exported 13 crates of poultry to the Pacific islands.

The following are particulars of horses exported: Draughts, 9 stallions, 9 mares, 6 geldings; thoroughbreds, 1 stallion, 1 mare, 4 fillies; light horses, 4 mares, 8 fillies, 15 colts, 1 gelding; trotting horse, 1 mare; pony, 1 stallion.

STOCK IN QUARANTINE.

THE following stock was received into quarantine during the month of March, 1915 :—

No.	Description.	Sex.	Port of Origin.	Owner or Agent.	Address.
	MOTUIHI ISLAND (AUCKLAND).				
	Nil.				
	SOMES ISLAND, WELLINGTON.				
1	Collie dog ..	Male ..	Liverpool ..	N.Z. Express Co...	Wellington.
2	Shropshire rams	Male ..	London ..	J. G. Wilson ..	Bull's.
	QUAIL ISLAND, LYTTELTON.				
2	Berkshire boars	Male ..	Hobart ..	Charles Brice ..	Christchurch.
1	Pomeranian bitch	Female	London ..	George Lewis ..	Christchurch.